DIVERSITY IN THE LIVING WORLD

1 Called 'The Darwin of the 20th century', identify the biologist who almost single-handedly made the origin of species diversity the central question of evolutionary biology that it is today:

1.	Ernst Mayr	2.	Louis Pasteur
3.	Charles Darwin	4.	Hugo de Vries

2 The number of species that are known and described ranges between:

1.	1.2 and 1.3 million	2.	1.4 and 1.5 million
3.	1.7 and 1.8 million	4.	2.1 and 2.2 million

3 In taxonomy:

I:	Nomenclature is critical as it allows a particular organism to be known by the same name all over the world.
II:	Identification is critical as nomenclature or naming is only possible when the organism is described correctly and we know to what organism the name is attached to.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

4 ICBN stands for:

1.	Indian Council for Biological Nomenclature
2.	International Code for Binomial Nomenclature
3.	Indian Council for Binomial Nomenclature
4.	International Code for Botanical Nomenclature

5 What is the purpose of ICZN?

1.	To regulate the names of animal species
2.	To control the import and export of zoological specimens
3.	To promote zoology as a field of study globally
4.	To provide guidelines for botanical gardens

6 The binomial system of nomenclature of living organisms was given by:

1.	Carl Woose	2.	Copeland
3.	Chatton	4.	Carl Linnaeus

7 Which of the following would be incorrect regarding universal rules of nomenclature of living organisms?

1.	Biological names are Latinised or derived from Latin irrespective of their origin.
2.	The first word in a biological name represents the genus while the second component denotes the specific epithet.
3.	Both the words in a biological name, when printed, are separately underlined, or handwritten in italics.
4.	The first word denoting the genus starts with a capital letter while the specific epithet starts with a small letter.

8 Name of the author in a biological name of a living organism:

I:	appears before the specific epithet, i.e., at the end of the generic name.
II:	is written in an abbreviated form.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

9 Consider the given two statements:

Statement I:	Classification of living organisms is important to make study of living organisms possible.
Statement II:	Classification is the process by which anything is grouped into convenient categories based on some easily observable characters.

1. **Statement I** is correct; **Statement II** is incorrect
2. **Statement I** is correct; **Statement II** is correct
3. **Statement I** is incorrect; **Statement II** is incorrect
4. **Statement I** is incorrect; **Statement II** is correct

10 Taxonomy is the part of systematics that is concerned with:

(a)	characterization and identification of living organisms
(b)	classification and nomenclature of living organisms
(c)	establishing evolutionary relationships between living organisms

1.	Only **(a)** and **(b)**	2.	Only **(a)** and **(c)**
3.	Only **(b)** and **(c)**	4.	**(a)**, **(b)** and **(c)**

11 Consider the given two statements:

Statement I:	The scientific term for convenient categories we use to study organisms is taxa.
Statement II:	An organism can belong to only one taxon.

1. **Statement I** is correct; **Statement II** is incorrect
2. **Statement I** is correct; Statement II is correct
3. **Statement I** is incorrect; **Statement II** is incorrect
4. **Statement I** is incorrect; **Statement II** is correct

12 The main difference between taxonomy and systematics is that:

1.	Taxonomy is involved in the naming and classification of organisms while systematics is involved in determining evolutionary relationships between organisms
2.	Systematics is involved in the naming and classification of organisms while taxonomy is involved in determining evolutionary relationships between organisms
3.	Taxonomy is not a true science and has largely been replaced with systematics
4.	Systematics can be considered as a part of taxonomy

13 The branch of biology that deals with the relationships of different groups of organisms and examines their natural variation and relationships is known as:

1.	Cladistics	2.	Systematics
3.	Taxonomy	4.	Identification

14 The book *Systema Naturae* was authored by:

1.	Linnaeus	2.	Theophrastus
3.	Aristotle	4.	Bentham and Hooker

TAXONOMIC CATEGORIES

15 Each taxonomic group/category:

I.	is merely a morphological aggregate
II.	is a distinct biological entity
III.	represents a rank

1. Only **II** is correct
2. Only **II** and **III** are correct
3. **I**, **II** and **III** are correct
4. Only **III** is correct

16 Consider the given two statements:

Statement I:	Genera are aggregates of closely related species.
Statement II:	Family has a group of related genera with still less number of similarities as compared to genus and species.

1.	**Statement I** is correct, **Statement II** is correct
2.	**Statement I** is correct, **Statement II** is incorrect
3.	**Statement I** is incorrect, **Statement II** is correct
4.	**Statement I** is incorrect, **Statement II** is incorrect

17 *Panthera tigris* belongs to the Felidae family. What taxonomic category does *Panthera* represent?

1.	Species	2.	Family
3.	Genus	4.	Order

18 *Solanum tuberosum, Solanum nigrum* and *Solanum melongena* belong to the same:

I:	Species
II:	Genus
III:	Family

1. Only **I**
2. Only **II** and **III**
3. Only **III**
4. **I**, **II** and **III**

19 In the taxonomic hierarchy, for *Prunus persica* [peach]:

I:	Genus will be a taxon and *Prunus* will be a category
II:	Species will be a taxon and *persica* will be a category

1. Both **I** and **II** are correct
2. Only **I** is correct
3. Only **II** is correct
4. Both **I** and **II** are incorrect

20 Which of the following 'suffixes' used for units of classification in plants indicates a taxonomic category of 'family'.

1.	- Ales	2.	- Onae
3.	- Aceae	4.	- Ae

21 Two organisms belonging to the same order may not belong to the same:

1.	Class	2.	Phylum
3.	Family	4.	Kingdom

22 Members belonging to Solanaceae and Convolvulaceae will not belong to the same:

I:	Order
II:	Family
III:	Division

1. Only **I** and **III**
2. Only **II**
3. Only **I**
4. **I, II** and **III**

23 Consider the following statements about taxonomic categories and identify the option which correctly interprets these statements:

Statement I:	Family is a higher category than Genus.
Statement II:	Species within the same genus have a few characteristics in common but differ significantly in their genetic makeup.
Statement III:	Organisms belonging to the same family would be more similar to each other than those in the same order.

1. Only **Statement I** and **Statement III** are correct.
2. Only **Statement I** and **Statement II** are correct.
3. All statements are correct.
4. Only **Statement I** is correct.

24 Which of the following statements is not true about the taxonomic hierarchy?

1.	The genus comprises one or more species that are closely related.
2.	Family groups together several genera that share fewer similarities as compared to species within a genus.
3.	Species is the most basic unit in the biological classification system.
4.	All members of a class in the taxonomic hierarchy must belong to the same family.

25 Both cats and dogs belong to same:

1.	species	2.	genus
3.	family	4.	order

26 Consider the given two statements:

Statement I:	Categories like species, genus and families are based on the aggregates of characters.
Statement II:	Order and other higher taxonomic categories are identified based on a number of similar characters.

1. **Statement I** is correct; **Statement II** is incorrect
2. **Statement I** is correct; **Statement II** is correct
3. **Statement I** is incorrect; **Statement II** is incorrect
4. **Statement I** is incorrect; **Statement II** is correct

27 The taxonomic category - Order Primata – includes all of the following animals except:

1. Monkey
2. Gorilla
3. Gibbon
4. Tiger

28 The taxonomic unit 'Phylum' in the classification of animals is equivalent to which hierarchical level in classification of plants?

1.	Class	2.	Order
3.	Division	4.	Family

29 If two living animals belong to the same phylum, they must belong to the same:

1.	Class	2.	Genus
3.	Kingdom	4.	Family

30 In plant taxonomy, the most inclusive category will be:

1.	Kingdom	2.	Division
3.	Class	4.	Order

31 A hierarchy is an arrangement of items that are represented as being "above", "below", or "at the same level as" one another. The correct ascending order of taxonomic hierarchy is:

1.	Species → Genus → Family → Order → Class → Division → Kingdom
2.	Species → Genus → Family → Class → Order → Division → Kingdom
3.	Species → Genus → Order → Family → Class → Division → Kingdom
4.	Genus → Species → Family → Order → Class → Kingdom → Division

32 Consider the given two statements:

Assertion (A):	The problem of classification becomes tougher as one ascends in the taxonomic hierarchy.
Reason (R):	Higher taxonomic categories are more complex, incorporating diverse members with fewer common characteristics.

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	**(A)** is False but **(R)** is True.

33 Consider the given two statements:

Assertion (A):	Higher the taxonomic category, greater is the difficulty of determining the relationship to other taxa at the same level.
Reason (R):	The higher taxonomic categories are more exclusive and the lower taxonomic categories are more inclusive in nature.

1.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**
2.	**(A)** is True but **(R)** is False
3.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**
4.	**(A)** is False but **(R)** is True

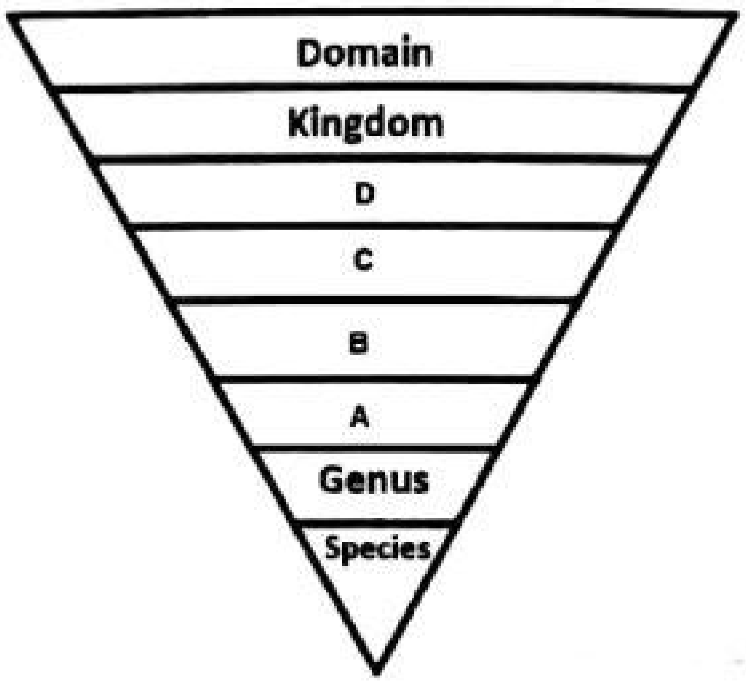
34 Which taxonomic category is not correctly matched with name regarding the classification of the housefly?

1.	Phylum: Arthropoda	2.	Class: Diptera
3.	Family: Muscidae	4.	Genus: *Musca*

35 Which of the following is a correct match between the biological name and the order of the organism?

1. *Homo sapiens* – Hominidae
2. *Mangifera indica* - Anacardiaceae
3. *Triticum aestivum* - Poaceae
4. *Mangifera indica* - Sapindales

36 In the given figure showing taxonomic hierarchy for living organisms:



I:	A would be *Solanum* for potato.
II:	B would be Muscidae for housefly.
III:	C would be Primata for humans.
IV:	D would be phylum for animals and division for plants.

1. Only **I**, **II** and **III** are incorrect
2. Only **I**, **III** and **IV** are incorrect
3. Only **II**, **III** and **IV** are incorrect
4. **I**, **II**, **III** and **IV** are incorrect

37 The number of correct statements from the given statements is:

a. Wheat belongs to the Order 'Sapindales'.
b. Housefly belongs to the Order 'Hymenoptera'.
c. Mango belongs to the Class 'Monocotyledonae'.
d. Man belongs to the Family 'Primata'.

1. 0
2. 1
3. 3
4. 4

38 Match the following taxonomic categories of wheat (Triticum aestivum) with their correct descriptions. a

	Column A		**Column B**
1.	Kingdom	A.	Poales
2.	Order	B.	Plantae
3.	Family	C.	*Triticum*
4.	Genus	D.	Poaceae
5.	Species	E.	*aestivum*

Options:

1. 1-B, 2-D, 3-A, 4-C, 5-E
2. 1-D, 2-B, 3-A, 4-E, 5-C
3. 1-B, 2-A, 3-D, 4-C, 5-E
4. 1-A, 2-D, 3-C, 4-B, 5-E

39 In plant classification, 'families' are characterised on the basis of:

I:	vegetative features of plant species.
II:	reproductive features of plant species.

1. Only **I**
2. Only **II**
3. Both **I** and **II**
4. Neither **I** nor **II**

40 Consider the given statements:

I:	Lion, leopard and tiger belong to the same species
II:	Lion, leopard, tiger and cats belong to same genus
III:	Lion, leopard, tiger, cats and dogs belong to same family

1.	Only **III** is correct	2.	Only **II** is correct
3.	Only **I** is incorrect	4.	**I**, **II** and **III** are incorrect

41 Match the following and choose the correct option:

A. Family	i. *tuberosum*
B. Kingdom	ii. Polynomiales
C. Order	iii. *Solanum*
D. Species	iv. Plantae
E. Genus	v. Solanacea

Options:

	i	ii	iii	iv	v
1.	D	C	E	B	A
2.	E	D	B	A	C
3.	D	E	B	A	C
4.	E	C	B	A	D

THE LIVING WORLD - ANSWER KEY

1.	**(1)**	2.	**(3)**	3.	**(3)**	4.	**(4)**	5.	**(1)**	6.	**(4)**	7.	**(3)**	8.	**(2)**	9.	**(2)**	10.	**(1)**
11.	**(1)**	12.	**(1)**	13.	**(2)**	14.	**(1)**	15.	**(2)**	16.	**(1)**	17.	**(3)**	18.	**(2)**	19.	**(4)**	20.	**(3)**
21.	**(3)**	22.	**(2)**	23.	**(1)**	24.	**(4)**	25.	**(4)**	26.	**(3)**	27.	**(4)**	28.	**(3)**	29.	**(3)**	30.	**(1)**
31.	**(1)**	32.	**(1)**	33.	**(2)**	34.	**(2)**	35.	**(4)**	36.	**(1)**	37.	**(1)**	38.	**(3)**	39.	**(3)**	40.	**(4)**
41.	**(1)**																		

INTRODUCTION

1 Who, amongst the following, was the earliest to attempt a more scientific basis of classification?

1.	Aristotle	2.	John Ray
3.	Tournefort	4.	Linnaeus

2 In Linnaeus' time, the number of Kingdoms of living organisms was

1.	2	2.	3
3.	4	4.	5

3 In the Two Kingdom classification, the Kingdom Plantae was erroneous with some major issues that include:

I:	Placing bacteria and blue green algae with eukaryotic groups
II:	Grouping together the unicellular organisms with multicellular ones
III:	Placing heterotrophic fungi with autotrophic plants

1.	**I and II only**	2.	**I and III only**
3.	**II and III only**	4.	**I, II and III**

4 In 1969, who proposed the five kingdom classification for living organisms?

1.	R.H. Whittaker	2.	C.Linnaeus
3.	A. Roxberg	4.	Virchow

5 The main criteria for classification used by Whittaker included all the following, except:

1. Cell structure and body organization
2. Mode of nutrition
3. Mode of reproduction
4. Mode of locomotion

6 Kingdom Monera in Whittaker's Five Kingdom classification is not characterized by:

1. Prokaryote cell type
2. Cellulosic cell wall
3. Absence of nuclear membrane
4. Cellular body organization

7 In Whittaker's Five Kingdom classification, heterotrophic mode of nutrition is present in members of:

1.	Two kingdoms	2.	Three kingdoms
3.	Four kingdoms	4.	Five kingdoms

8 Which of the following organisms, earlier placed in Animal Kingdom, is placed under Kingdom Protista in Whittaker's classification?

1.	*Ameoba proteus*	2.	*Chlamydomonas*
3.	*Gonyaulax*	4.	*Chlorella*

9 What characters will be similar in members of Kingdom Fungi and Kingdom Animalia as per Whittaker's Five Kingdom Classification?

a. Cell type
b. Cell wall
c. Body organisation

1.	Only a	2.	Only b and c
3.	Only a and c	4.	Only c

10 Which of the following is not true regarding the structure of the cell wall in members of various Kingdoms in Whittaker's classification system?

1.	It is composed of polysaccharides and amino acids in Monera.
2.	All members of Kingdom Protista have a cell wall, usually cellulosic.
3.	Cell wall with chitin is present in Fungi.
4.	Animals lack a cell wall in their cells.

11 Study the Assertion statement followed by the Reason statement given below:

Assertion(A):	*Paramoecium* and *Amoeba*, which were earlier placed in the animal kingdom which lack cell wall, are placed under Kingdom Protista in Whittaker's Classification.
Reason(R):	The unicellular eukaryotic organisms are placed in Kingdom Protista in Whittaker's Classification.

1.	**(A)** is true and **(R)** is false.
2.	Both **(A)** and **(R)** are true and **(R)** is a correct explanation of **(A)**.
3.	Both **(A)** and **(R)** are true but **(R)** is not a correct explanation of **(A)**.
4.	**(A)** is false and **(R)** is true.

12 Phylogenetic classification is based on:

1.	Morphological similarities	2.	Physiological similarities
3.	Reproductive similarities	4.	Evolutionary relationships

13 The three-domain system has also been proposed that divides Kingdom Monera into two domains that separates:

1.	Autotrophic bacteria and Heterotrophic bacteria
2.	Bacteria with a cell wall and Bacteria that lack a cell wall
3.	Archaebacteria and Eubacteria
4.	Pathogenic and Non-pathogenic bacteria

KINGDOM MONERA

14 Match the bacteria in Column I with its shape in Column II and select the correct option from the codes given below:

	COLUMN I		COLUMN II
A	Bacillus	a	Rod
B	Coccus	b	Spherical
C	Spirilla	c	Spiral
D	Vibrio	d	Comma

Codes

	A	B	C	D
1.	a	b	c	d
2.	b	a	c	d
3.	a	d	c	b
4.	b	a	d	c

15 As a group the most extensive metabolic diversity is shown by:

1.	Bacteria	2.	Protista
3.	Fungi	4.	Animals

16 The vast majority of bacteria are:

1.	Heterotrophs	2.	Photoautotrophs
3.	Chemosynthetic autotrophs	4.	Methanotrophs

ARCHAEBACTERIA

17 Halophiles are archaebacteria adapted to extreme:

1.	Hot habitats	2.	Saline habitats
3.	Marshy habitats	4.	Cold habitats

18 Organisms, present in the gut of several ruminant animals and responsible for the production of methane (biogas) from the dung of these animals, are:

1.	Archaebacteria	2.	Eubacteria
3.	Blue green algae	4.	Desmids

19 Consider the given two statements:

Statement I:	Archaebacteria can survive in extreme conditions.
Statement II:	Methanogens are archaebacteria.

1.	**Statement I** is correct; **Statement II** is correct
2.	**Statement I** is incorrect; **Statement II** is correct
3.	**Statement I** is correct; **Statement II** is incorrect
4.	**Statement I** is incorrect; **Statement II** is incorrect

20 What is a key difference between Archaebacteria and Eubacteria?

1.	Archaebacteria have peptidoglycan in their cell walls, while Eubacteria do not.
2.	Archaebacteria are typically found in extreme environments, whereas Eubacteria are found in more diverse environments.
3.	Eubacteria are prokaryotes, and Archaebacteria are eukaryotes.
4.	Eubacteria reproduce sexually, while Archaebacteria reproduce asexually.

21 What would be true for both eubacteria and archaebacteria?

A:	Both are prokaryotes
B:	Both have similar structure of cell wall

1. Only **A** is correct
2. Only **B** is correct
3. Both **A** and **B** are correct
4. Both **A** and **B** are incorrect

22 Archaebacteria do not include:

1. Halophiles
2. Thermoacidophiles
3. Methanogens
4. Blue green algae

EUBACTERIA

23 Which bacterial group is known for nitrogen fixation as well as carrying out oxygenic photosynthesis?

1. Cyanobacteria
2. Methanogens
3. Chemoheterotrophic bacteria
4. Mycoplasma

24 Study the Assertion statement followed by the Reason statement given below:

Assertion(A):	The cyanobacteria that are also referred to as blue green algae are not 'algae' any more.
Reason(R):	The cyanobacteria are photosynthetic autotrophs.

1.	**(A)** is true and **(R)** is false.
2.	Both **(A)** and **(R)** are true and **(R)** is a correct explanation of **(A)**.
3.	Both **(A)** and **(R)** are true but **(R)** is not a correct explanation of **(A)**.
4.	**(A)** is false and **(R)** is true.

25 *Nostoc:*

I:	is a cyanobacterium.
II:	is photosynthetic autotroph.
III:	is capable of fixing atmospheric nitrogen.

1. Only **I** and **II** are correct
2. Only **I** and **III** are correct
3. Only **II** and **III** are correct
4. **I, II** and **III** are correct

26 How many of the given statements are true?

I:	The cyanobacteria that are also referred to as blue green algae are not 'algae'.
II:	Yeast, although unicellular, are fungi.
III:	Mycoplasma lack a cell wall but are bacteria.

1. 0
2. 1
3. 2
4. 3

27 Cyanobacteria:

I.	are also referred to as 'blue green algae'.
II.	are photosynthetic autotrophs with chlorophyll a similar to green plants.
III.	often form blooms in polluted water bodies.
IV.	some of them can fix atmospheric nitrogen in specialised cells called hetrocysts.

In light of the above given statements:

1.	Only **I, II** and **IV** are correct	2.	Only **I, II** and **III** are correct
3.	All statements are correct	4.	Only **I** and **III** are correct

28 What kind of bacteria play a great role in recycling nutrients like nitrogen, phosphorous, iron and sulphur?

1. Photoautotrophs
2. Photoheterotrophs
3. Chemosynthetic autotrophs
4. Methanogens

29 Which of the following statements about chemosynthetic autotrophic bacteria is true?

1.	They utilize sunlight to produce organic compounds from carbon dioxide.
2.	They convert nitrogen in the atmosphere into ammonia.
3.	They obtain energy through the oxidation of inorganic substances to fix carbon dioxide.
4.	They are primarily found in hydrothermal vents and do not require oxygen for survival.

30 Chemosynthestic autotrophic bacteria:

I.	Produce ATP by oxidizing inorganic substances
II.	Play a great role in recycling nutrients like nitrogen, phosphorus, iron and sulfur

1.	Both **I** and **II** are correct	2.	Only **I** is correct
3.	Only **II** is correct	4.	Both **I** and **II** are incorrect

31 Which of the following does not relate to heterotrophic bacteria?

1.	They are important decomposers.
2.	They are helpful in making curd from milk, production of antibiotics and fixing nitrogen in legume roots.
3.	Some are pathogens causing damage to human beings, crops, farm animals and pets.
4.	Almost all help in recycling nutrients like nitrogen, phosphorus, iron and sulphur.

32 Which of the following plant diseases in not caused by a fungus?

1. Late blight of potato
2. Loose smut of wheat
3. Canker in citrus
4. Powdery mildew of grape vine

33 Identify the incorrect statement regarding true bacteria?

1.	As a group, they exhibit maximum metabolic diversity.
2.	Chemosynthetic autotrophic bacteria play a great role in recycling nutrients like nitrogen, phosphorous, iron and sulphur.
3.	Heterotrophic bacteria are the most abundant in nature.
4.	Bacteria reproduce mainly by fission but sometimes under favourable conditions, they produce spores.

34 Bacteria reproduce mainly by:

1. fission
2. producing spores
3. a primitive type of DNA transfer
4. sexual method

35 Consider the given two statements:

I:	Mycoplasma are naturally resistant to antibiotics that target cell wall synthesis
II:	They are the smallest bacteria discovered yet

1. Both **I** and **II** are correct and **II** explains **I**
2. Both **I** and **II** are correct but **II** does not explain **I**
3. **I** is correct but **II** is incorrect
4. Both **I** and **II** are incorrect

36 Cell wall is absent in:

1.	*Funaria*	2.	Mycoplasma
3.	*Nostoc*	4.	*Aspergillus*

37 The Mycoplasma:

I:	are organisms that completely lack a cell wall.
II:	are the smallest living cells known and can survive without oxygen.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

38 Consider the given two statements:

Assertion(A):	Mycoplasma are members of Kingdom Monera.
Reason (R):	They lack cell wall and can live without oxygen.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
3.	**(A)** is True; **(R)** is False
4.	Both **(A)** and **(R)** are False

39 Mycoplasma are organisms that:

I.	completely lack a cell wall.
II.	are the smallest living cells known.
III.	can survive without oxygen.
IV.	include forms which are pathogenic in animals and plants.

1. Only **I, II** and **III** are correct
2. Only **I, III** and **IV** are correct
3. Only **II, III** and **IV** are correct
4. **I, II, III** and **IV** are correct

KINGDOM PROTISTA

40 In NCERT textbook which of the following are not included in Kingdom Protista?

1.	Chrysophytes	2.	Dinoflagellates
3.	Protozoa	4.	Blue green algae

41 A unicellular and eukaryotic organisms belongs to Kingdom:

1.	Monera	2.	Protista
3.	Fungi	4.	Archaea

CHRYSOPHYTES

42 The chief producers in the oceans are:

1.	Floating hydrophytes	2.	Blue green algae
3.	Desmids	4.	Diatoms

43 Chrysophytes:

I.	include diatoms and desmids
II.	are found only in marine water
III.	are planktonic

1. Only **I** and **II** are correct
2. Only **I** and **III** are correct
3. Only **II** and **III** are correct
4. **I, II** and **III** are correct

44 The cell walls of diatoms are 'indestructible' as they are embedded with:

1.	Silica	2.	Chitin
3.	Calcium	4.	Raphides

45 In which group of organisms the cell walls form two thin overlapping shells which fit together?

1.	Chrysophytes	2.	Euglenoids
3.	Dinoflagellates	4.	Slime moulds

46

Assertion (A):	Diatoms are the chief 'producers' in the oceans.
Reason (R):	Diatoms are one of the most abundant and diverse groups of photosynthetic phytoplankton in the oceans.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	Both **(A)** and **(R)** are True and **(R)** does not correctly explain **(A)**.
3.	**(A)** is True; **(R)** is False
4.	Both **(A)** and **(R)** are False

47 Identify the correct statements regarding diatoms:

I:	Diatoms are chief producers in the oceans
II:	Diatoms are microscopic and float passively in water
III:	The walls of diatoms are easily destructible
IV:	'Diatomaceous earth' is formed by the cell walls of diatoms

1. Only **I, II** and **III**
2. Only **I, II** and **IV**
3. Only **II, III** and **IV**
4. **I, II, III** and **IV**

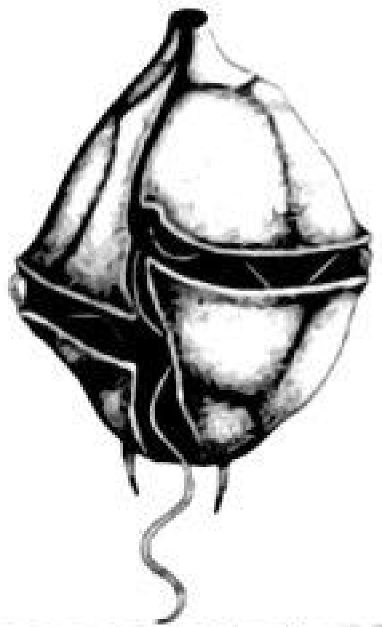
48 Consider the given two statements:

Assertion(A):	Diatoms have left behind large amount of cell wall deposits in their habitat.
Reason(R):	Diatoms are the chief 'producers' in the oceans.

1.	Both **(A)** and **(R)** are True and **(R)** explains **(A)**
2.	Both **(A)** and **(R)** are True and **(R)** does not explain **(A)**
3.	**(A)** is True but **(R)** is False
4.	**(A)** is False but **(R)** is True

DINOFLAGELLATES

49 The organism shown in the given figure is a/an:



1.	Archaebacterium	2.	Chrysophyte
3.	Dinoflagellate	4.	Blue green laga

50

Statement I:	Dinoflagellates are mostly marine and photosynthetic.
Statement II:	Majority of Euglenoids are fresh water organisms.

1.	**Statement I** is correct; **Statement II** is correct
2.	**Statement I** is correct; **Statement II** is incorrect
3.	**Statement I** is incorrect; **Statement II** is correct
4.	**Statement I** is incorrect; **Statement II** is incorrect

51 Two flagella are seen in:

I.	most dinoflagellates
II.	euglenoids

1. Only **I**
2. Only **II**
3. Both **I** and **II**
4. Neither **I** nor **II**

52 The phenomenon of red tides is associated with blooms of:

1.	Zooxanthelle	2.	*Gonyaulax*
3.	Blue green algae	4.	*Ctenoplana* and *Beroe*

53 Which of the following is not a characteristic o dinoflagellates?

1.	Mostly fresh water and photosynthetic
2.	Cell wall with stiff cellulosic plates
3.	Two flagella
4.	Various colored pigments in the cell

EUGLENOIDS

54 The body of Euglenoids is flexible because of presence of:

1.	a cell wall made up of pseudopeptidoglycan
2.	a protein rich pellicle and absence of cell wall
3.	a phosphate ether bonding in phospholipids in cell membrane
4.	lipopolysaccharide layer in the outer cell wall

55 Identify the incorrect statement regarding Euglenoids:

1.	Majority are found in fresh stagnant water
2.	Presence of two flagella
3.	Behave as heterotrophs when deprived of sunlight
4.	Pigments entirely different from those found in higher plants

56 How many of the given statements are correct regarding euglenoids:

I:	The majority of them are freshwater organisms found in stagnant water.
II:	Instead of a cell wall, they have a protein rich layer called pellicle which makes their body flexible.
III:	They have more than two flagella, on all sides of their body.
IV:	The pigments of euglenoids are identical to those present in higher plants.

1. 1
2. 2
3. 3
4. 4

57 Consider the given statements:

Statement I:	When deprived of sunlight, euglenoids behave like heterotrophs.
Statement II:	During unfavorable conditions, slime moulds form plasmodium.

1. **Statement I** is correct; **Statement II** is correct
2. **Statement I** is correct; **Statement II** is incorrect
3. **Statement I** is incorrect; **Statement II** is correct
4. **Statement I** is incorrect; **Statement II** is incorrect

SLIME MOULDS

58 Slime moulds:

I:	under unfavourable conditions, they form an aggregation called plasmodium which may grow and spread over several feet.
II:	during suitable conditions, the plasmodium differentiates and forms fruiting bodies bearing spores at their tips.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

59 What will not be true for spores in slime moulds?

1.	They are borne on fruiting bodies formed by plasmodium during favourable conditions.
2.	They possess true walls.
3.	They are extremely resistant and survive for many years.
4.	They are dispersed by air currents.

60 Which group of organisms are characterised by a naked cytoplasm, multinucleated plasmodium and saprophytic nutrition?

1.	Monera	2.	Chrysophytes
3.	Fungi	4.	Slime molds

61 The saprophytic protists are:

1.	Slime moulds	2.	Protozoans
3.	Desmids	4.	Dinoflagellates

62 Naked cytoplasm, multinucleated and saprophytic are the characteristics of

1.	Monera	2.	Protista
3.	Fungi	4.	Slime molds

63 Consider the given statements regarding slime moulds:

Statement I:	Under unfavourable conditions they form a plasmodium.
Statement II:	During favourable conditions, the plasmodium differentiates and forms fruiting bodies bearing spores at their tips.
Statement III:	The spores bear true walls.
Statement IV:	The spores are dispersed by water.

1. Only **Statement I** and **Statement II** are correct
2. Only **Statement III** is correct
3. All statements are incorrect
4. Only **Statement III** and **Statement IV** are correct

64 The thalloid body of a slime mould (Myxomycetes) is known as:

1.	protonema	2.	Plasmodium
3.	fruiting body	4.	mycelium

PROTOZOANS

65 African sleeping sickness is caused by an infection with:

1.	a dsDNA virus	2.	a gran negative bacterium
3.	a flagellated protozoan	4.	a fungus

66 Match the following protozoa with their respective characteristics:

	Column I		Column II
A.	*Amoeba*	i.	Causes sleeping sickness
B.	*Paramecium*	ii.	Has pseudopodia
C.	*Trypanosoma*	iii.	Possesses cilia
D.	*Plasmodium*	iv.	Causes malaria

1.	A-ii, B-iii, C-i, D-iv	2.	A-i, B-ii, C-iii, D-iv
3.	A-iii, B-iv, C-i, D-ii	4.	A-iv, B-i, C-ii, D-iii

67 The major criteria used for classification of Protozoans is:

1.	Nature of cell envelope	2.	Mode of locomotion
3.	Mode of heterotrophic nutrition	4.	Habitat

68 Match each item in Column I with one in Column II and choose the correct answer from the codes given:

	Column I		Column II
A	*Entamoeba*	a	Flagellated protozoan
B	*Trypanosoma*	b	Amoeboid protozoan
C	*Paramecium*	c	Non motile protozoan
D	*Plasmodium*	d	Ciliated protozoan

Codes

	A	B	C	D
1.	a	b	c	d
2.	b	a	c	d
3.	a	b	d	c
4.	b	a	d	c

69 Match the group of Protozoans to a feature these protozoans exhibit:

	Column I		Column II
A	Amoeboid	P	They have a cavity (gullet) that opens to the outside of the cell surface into which water laden food is steered
B	Flagellated	Q	Marine forms have silica shells on their surface
C	Ciliated	R	The parasitic forms cause diseases such as sleeping sickness
D	Sporozoans	S	They have an infectious spore-like stage in their life cycles

	A	B	C	D
1	R	Q	P	S
2	Q	R	P	S
3	Q	R	S	P
4	S	Q	R	P

KINGDOM FUNGI

70 What will not be true for members of Kingdom Fungi?

1. The fungi are heterotrophic organisms.
2. Fungi are cosmopolitan and occur in air, water, soil and on animals and plants.
3. They prefer to grow in warm and humid places.
4. None of the members is unicellular.

71 Which of the following is not a fungus?

1. Causative agent of white spots on mustard
2. Source of penicillin
3. Wheat-rust causing organism
4. Causative agent of citrus canker

72 Identify the incorrect statement regarding body organization in fungi:

1. With the exception of yeast, fungi are filamentous.
2. Their bodies consist of long, slender hyphae that may be coenocytic or septate.
3. The network of hyphae is known as the mycelium.
4. The cell walls of fungi lack chitin and polysachharides.

73 Yeast is unique amongst the members of Kingdom Fungi because it:

1. reproduces by ascospores
2. is unicellular
3. does not have a chitinous cell wall
4. does not have a sexual mode of reproduction

74 Regarding the structural organisation of fungi:

I:	Their bodies consist of long, slender thread-like structures called hyphae.
II:	The network of hyphae is known as mycelium.
III:	Some hyphae are continuous tubes filled with multinucleated cytoplasm – these are called coenocytic hyphae.
IV:	The cell walls of fungi are composed of chitin and polysaccharides.

1. Only **I**, **II** and **III** are correct
2. Only **I**, **III** and **IV** are correct
3. Only **II**, **III** and **IV** are correct
4. **I**, **II**, **III** and **IV** are correct

75 Coenocytic hyphae:

I.	are continuous tubes filled with multinucleated cytoplasm.
II.	have septae or cross walls.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

76 A symbiotic relation between fungi and the roots of higher plants is called as:

1.	Lichen	2.	Mycorrhiza
3.	Amensal	4.	Proto-cooperation

77 Which of the following is not used in asexual reproduction in fungi?

1.	Conidia	2.	Sporangiospores
3.	Zoospores	4.	Ascospores

78 The correct chronological steps [earliest to last] in the sexual cycle of fungi are:

1.	Plasmogamy – Karyogamy – Mitosis in zygote resulting in diploid spores
2.	Plasmogamy – Karyogamy – Meiosis in zygote resulting in haploid spores
3.	Karyogamy – Plasmogamy – Mitosis in zygote resulting in diploid spores
4.	Karyogamy – Plasmogamy – Meiosis in zygote resulting in haploid spores

79 The dikaryon is a nuclear feature that is unique to certain fungi including the members of class:

I.	Phycomycetes
II.	Ascomycetes
III.	Deuteromycetes
IV.	Basidiomycetes

1. **I** and **II** only
2. **I** and **IV** only
3. **II** and **III** only
4. **II** and **IV** only

80 Consider the given two statements:

Statement I:	The sexual cycle in fungi chronologically involves karyogamy, followed by meiosis in zygote and lastly plasmogamy.
Statement II:	In fungi, other than ascomycetes and basidiomycetes, a condition called as dikaryon and a phase called as dikaryophase is seen.

1. **Statement I** is correct; **Statement II** is correct
2. **Statement I** is incorrect; **Statement II** is correct
3. **Statement I** is incorrect; **Statement II** is incorrect
4. **Statement I** is correct; **Statement II** is incorrect

81 The basis of classification for the division of Kingdom Fungi into various classes includes all the following except:

1. Morphology of the mycelium
2. Mode of spore formation
3. Types of pigments present
4. Fruiting bodies

PHYCOMYCETES

82 Mucor, *Rhizopus* [the bread mould] and *Albugo* [the parasitic fungi on mustard] belong to:

1.	Phycomycetes	2.	Ascomycetes
3.	Basidiomycetes	4.	Deuteromycetes

83 Which of the following is not true for fungi belonging to the class phycomycetes?

1.	Aseptate and coenocytic mycelium
2.	Spores endogenously produced in sporangium
3.	Asexual reproduction by nonmotile zoospores or motile aplanospores
4.	Found in aquatic habitats, decaying wood or as obligate parasites on plants

84 Members of phycomycetes are found

I.	In aquatic habitats
II.	On decaying wood
III.	In moist and damp places
IV.	As obligate parasites on plant

Choose from the following options:

1. None of the above	2. **I** and **IV**
3. **II** and **III**	4. All of the above

85 Identify the true [T] and false [F] statements regarding characteristics seen in the members of fungal class phycomycetes:

I.	Mycelium is aseptate and coenocytic.
II.	Asexual reproduction takes place by zoospores (motile) or by aplanospores (non-motile).
III.	Asexual spores are exogenously produced on the sporangium.

	I	II	III
1.	F	T	F
2.	T	T	F
3.	F	T	T
4.	T	F	F

86 Plasmogamy is not immediately followed by karyogamy in:

1. Ascomycetes and basidiomycetes
2. Ascomycetes and phycomycetes
3. Deuteromycetes and basidiomycetes
4. Deuteromycetes and phycomycetes

87 Identify the incorrect statements regarding phycomycetes:

I.	Found in aquatic habitats and on decaying wood in moist and damp places or as obligate parasites on plants.
II.	Mycelium is aseptate and coenocytic.
III.	Asexual reproduction takes place by zoospores (motile) or by aplanospores (non-motile).
IV.	These spores are endogenously produced in sporangium.
V.	A zygospore is formed by the fusion of two gametes.

1. None, all are correct
2. Only **III**
3. Only **II**, **III**, **IV** and **V**
4. Only **I**

ASCOMYCETES

88 A fungus used extensively in biochemical and genetic work is:

1.	*Neurospora*	2.	*Trichoderma*
3.	*Paecilomyces*	4.	*Streptomyces*

89 Which of the following is not a character of Ascomycetes?

1.	Mycelium is unbranched and septate
2.	Asexual spores conidia are produced exogenously
3.	Sexual spores called ascospores are produced endogenously
4.	Conidia on germination produce mycelium

90 Morels and truffles are edible fungi belonging to the class:

1.	Phycomycetes	2.	Ascomycetes
3.	Basidiomycetes	4.	Deuteromycetes

91 Which of the following statements is incorrect?

1.	Yeasts have filamentous bodies with long thread-like hyphae
2.	Morels and truffles are edible delicacies
3.	*Claviceps* is a source of many alkaloids and LSD
4.	Conidia are produced exogenously and ascopores endogenously

92 In a fungus like *Neurospora*, conidia can be distinguished from ascospores as:

1.	ascospores are diploid, conidia are haploid
2.	ascospores are produced only by meiosis, conidia are produced only by mitosis
3.	ascospores have undergone genetic recombination during their production, conidia have not
4.	ascospores are larger, conidia are smaller

93 The asexual spores in Ascomycetes:

I:	are called conidia.
II:	are produced endogenously

1.	Only **I** is correct	2.	Only **II** is correct
3.	Both **I** and **II** are correct	4.	Both **I** and **II** are incorrect

94 Identify the fungal class:

I:	Commonly known as sac-fungi
II:	Mycelium is branched and septate
III:	The asexual spores are conidia produced exogenously

1.	Phycomycetes	2.	Ascomycetes
3.	Basidiomycetes	4.	Deuteromycetes

95 The fungal class ascomycetes does not include:

1. *Morels and truffles*
2. *Neurospora and Claviceps*
3. *Aspergillus, Saccharomyces*
4. Puff balls and smuts

96 Morels and truffles:

1.	are pathogenic fungi causing rust and smut
2.	do not reproduce sexually
3.	do not produce asexual spores
4.	are delicacies belonging to ascomycetes

97 How many of the given statements will be true for the members of the class ascomycetes of fungi?

(i)	These are commonly called sac fungi
(ii)	These are mostly multicellular
(iii)	They are saprotrophic, decomposers, parasitic or coprophilous
(iv)	Their mycelium is aseptate
(v)	Conidia produced by them are endogenous

1. Two
2. Three
3. Four
4. Five

BASIDIOMYCETES

98 Rusts and Smuts are the fungi that belong to:

1.	Phycomycetes	2.	Ascomycetes
3.	Basidiomycetes	4.	Deuteromycetes

99 Which of the following is not a feature of the members of the class Basidiomycetes?

1. Branched and septate mycelium
2. Asexual spores are generally not formed
3. Vegetative reproduction not seen
4. Dikaryon stage commonly seen

100 What is not true regarding sexual reproduction in basidiomycetes?

1.	Sex organs are well developed
2.	Plasmogamy is brought about by fusion of two vegetative or somatic cells of different strains or genotypes
3.	Karyogamy and meiosis take place in basidium, producing four basidiospores
4.	Basidiospores are produced exogenously on the basidium

101 After karyogamy followed by meiosis, spores are produced exogenously in

1.	*Neurospora*	2.	*Alternaria*
3.	*Agaricus*	4.	*Saccharomyces*

102 Which pair belongs to basidiomycetes?

1.	Puffball and *Claviceps*	2.	Peziza and Stink Horn
3.	Morchella and Mushroom	4.	Bracket fungi and Puffballs

103 How many of the given pairs are correctly matched for Basidiomycetes?

A.	Basidium	Bears spores
B.	Basidiospores	Asexual Spores
C.	Basidiocarp	Fruiting body

1. 0
2. 1
3. 2
4. 3

104 In basidiomycetes:

I:	The asexual spores are generally not found.
II:	Vegetative reproduction by fragmentation is common.
III:	The sex organs are absent.

1. Only **I** and **II** are correct
2. Only **I** and **III** are correct
3. Only **II** and **III** are correct
4. **I, II** and **III** are correct

105 The correct differences between the members of ascomycetes and basidiomycetes will include:

	Ascomycetes	**Basidiomycetes**
I:	Mycelium is branched and septate.	Mycelium is aseptate and coenocytic.
II:	Asexual spores are conidia.	Asexual spores are zoospores.
III:	Sexual spores are produced endogenously in sac like asci.	Sexual spores are exogenously produced on the basidium.

1.	None	2.	Only **I** and **II**
3.	**I, II and III**	4.	Only **III**

106 In basidiomycetes:

Statement I:	The sex organs are absent, but plasmogamy is brought about by fusion of two vegetative or somatic cells of different strains or genotypes.
Statement II:	The basidiospores are exogenously produced on the basidium.

1. **Statement I** is correct; **Statement II** is correct
2. **Statement I** is incorrect; **Statement II** is correct
3. **Statement I** is correct; **Statement II** is incorrect
4. **Statement I** is incorrect; **Statement II** is incorrect

107 Match the following examples of fungal classes with their characteristics as given in NCERT:

	Column I		**Column II**
A	Ascomycetes	P	Club-shaped reproductive structure
B	Basidiomycetes	Q	Sexual spores borne internally in sacs
C	Phycomycetes	R	Includes Mucor and Rhizopus
D	Deuteromycetes	S	Known for lacking sexual reproduction

Codes:

	A	B	C	D
1.	Q	R	S	P
2.	P	Q	R	S
3.	Q	P	R	S
4.	S	P	Q	R

108 Identify the incorrect match:

1. Phycomycetes: *Rhizopus, Mucor*
2. Ascomycetes: *Penicillium, Saccharomyces*
3. Basidiomycetes: *Neurospora, Claviceps*
4. Deuteromycetes: *Alternaria, Trichoderma*

DEUTEROMYCETES

109 *Alternaria*, *Colletotrichum* and *Trichoderma* belong to the class:

1.	Phycomycetes	2.	Ascomycetes
3.	Basidiomycetes	4.	Deuteromycetes

110 Deuteromycetes are also called as Fungi imperfecti because:

1. They do not have a thalloid body
2. They can contain chlorophyll
3. There are no parasitic members
4. Sexual phases are not known

111 Which of the following is not true regarding members of Dueteromycetes?

1.	Mycelium is septate and branched.
2.	Many are decomposers and help in mineral cycling.
3.	They reproduce only by asexual spores called as conidia.
4.	They include *Agaricus*, *Claviceps* and *Colletotrichum*.

112 Given below are two statements: one is labeled Assertion (A) and the other is labelled as Reason (R):

Assertion (A):	*Alternaria*, *Colletotrichum* and *Trichoderma* are kept in the fungal class-deuteromycetes.
Reason (R):	Asexual and vegetative phases in the life cycle of these fungi are not known.

In the light of the above statements, choose the correct answer from the options given below:

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	Both **(A)** and **(R)** are False.

113 The imperfect fungi which are decomposer of litter and help in mineral cycling belong to:

1.	Basidiomycetes	2.	Phycomycetes
3.	Ascomycetes	4.	Deuteromycetes

114 Deuteromycetes are commonly known as imperfect fungi because only the asexual or vegetative phases of these fungi are known. What can be the possible reason(s) of unawareness of sexual phases in these fungi?

I:	Sexual phases are yet to be discovered.
II:	The asexual and vegetative stage have been given one name (and placed under deuteromycetes) and the sexual stage another (and placed under another class).

1. Only **I**
2. Only **II**
3. Both **I** and **II**
4. Neither **I** nor **II**

KINGDOM ANIMALIA

115 Which of the following will not be true for members of Kingdom Animalia?

1.	They all are multicellular
2.	Mode of nutrition is heterotrophic – holozoic
3.	Most are capable of locomotion
4.	They do not follow a definite growth plan

KINGDOM PLANTAE

116 Amongst the plants:

I:	Bladderwort and Venus flytrap are insectivorous.
II:	*Cuscuta* is parasitic.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

117 Bladderwort and Venus fly trap are:

I:	examples of insectivorous plants.
II:	partially heterotrophic.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

118 An example of a parasitic plant will be:

1. Venus flytrap
2. Bladderwort
3. *Cuscuta*
4. Pitcher plant

VIRUS, VIROIDS, PRIONS & LICHENS

119 Consider the given two statements:

Statement I:	In the five kingdom classification of Whittaker, there is no mention of lichens, viruses, viroids and prions.
Statement II:	Lichens, viruses, viroids and prions are all 'acellular' organisms.

1. **Statement I** is correct; **Statement II** is correct
2. **Statement I** is incorrect; **Statement II** is correct
3. **Statement I** is correct; **Statement II** is incorrect
4. **Statement I** is incorrect; **Statement II** is incorrect

120 Viruses are not considered truly 'living', if we understand living as those organisms that:

1.	have an inert crystalline structure outside the living cell.
2.	once infect a cell, take over the machinery of the host cell to replicate themselves.
3.	have a cell structure.
4.	have double stranded DNA as their genetic material.

121 Which of the following would best describe a virus?

1.	Non cellular organization, crystalline inert structure in a living cell
2.	Non cellular organization, crystalline inert structure outside a living cell
3.	Cellular organization, crystalline inert structure in a living cell
4.	Cellular organization, crystalline inert structure outside a living cell

122 Consider the two statements:

Statement I:	Viruses are obligate cellular endoparasites.
Statement II:	Once they infect a cell they take over the machinery of the host cell to replicate themselves, killing the host.

1. **Statement I** is correct; **Statement II** is correct
2. **Statement I** is correct; **Statement II** is incorrect
3. **Statement I** is incorrect; **Statement II** is correct
4. **Statement I** is incorrect; **Statement II** is incorrect

123 *Contagium vivum fluidum* was proposed by

1.	D. J. Ivanowsky	2.	M. W. Beijerinek
3.	Stanley	4.	Robert Hooke

124 Name the scientist:

I.	He studied the tobacco mosaic virus.
II.	He succeeded in extracting the virus in the form of pure crystals in 1935.
III.	He was able to show that the tobacco mosaic virus is composed of protein and RNA.

1.	D. J. Ivanovsky	2.	W. M. Stanley
3.	M. W. Beijerinck	4.	Louis Pasteur

125 Match Scientists in Column I with their contributior in the field of virology given in Column II and select your answer from the codes given below:

	Column I		**Column II**
A	D. J. Ivanowsky	a	Recognized tobacco mosaic is caused by microbes smaller than bacteria
B	M. W. Beijerinck	b	Demonstrated extract of infected tobacco plants could cause infection in healthy plants
C	W. M. Stanley	c	Showed that viruses could be crystallized

Codes:

	A	B	C
1.	a	b	c
2.	a	c	b
3.	b	a	c
4.	c	b	a

126 How many of the given statements regarding viruses are correct?

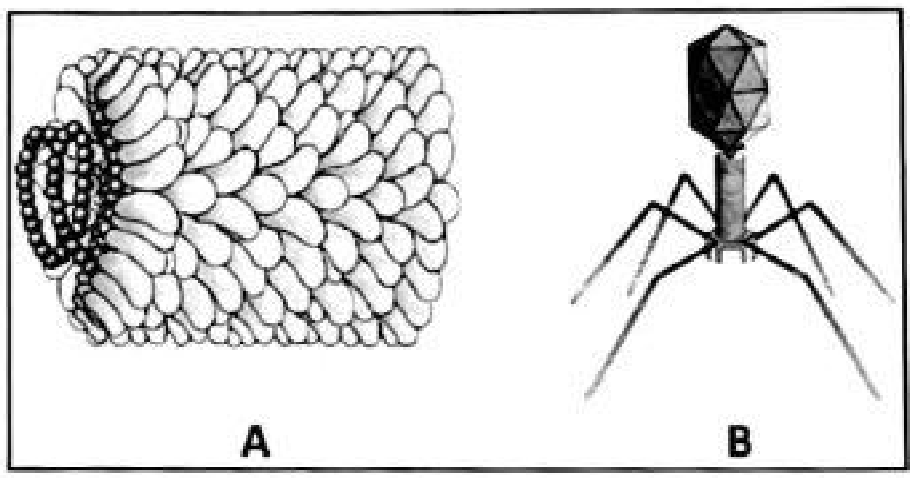
I:	No virus contains both RNA and DNA.
II:	A virus is a nucleoprotein and the genetic material is infectious.
III:	In general, viruses that infect plants have single stranded RNA.
IV:	Bacterial viruses or bacteriophages (viruses that infect the bacteria) are usually double stranded DNA viruses.

1.	1	2.	2
3.	3	4.	4

127 In general, the viruses that infect plants have:

1.	Single stranded RNA	2.	Single stranded DNA
3.	Double stranded RNA	4.	Double stranded DNA

128 Identify the correct statement regarding the given figure:



1.	A is a plant pathogen and has single stranded RNA as its genetic material; B infects bacteria and usually has double stranded DNA as its genetic material.
2.	A is an animal pathogen and has double stranded RNA as its genetic material; B infects bacteria and usually has double stranded DNA as its genetic material.
3.	A infects bacteria and usually has double stranded DNA as its genetic material; B is a plant pathogen and has single stranded RNA as its genetic material.
4.	A is a plant pathogen and has single stranded RNA as its genetic material; B infects bacteria and usually has single stranded RNA as its genetic material.

129 Capsid of a virus:

1.	protects the genetic material.
2.	is infectious.
3.	is composed of capsomeres made up of complex polysaccharides.
4.	is a nucleoprotein.

130 Identify the statements which will be incorrect regarding viruses:

I:	Viruses possess their own metabolic system
II:	All viruses contain RNA and DNA
III:	Viruses are obligate parasites
IV:	Nucleic acid of virus is known as capsid

1. Only **I, II** and **III**
2. Only **I, II** and **IV**
3. Only **II, III** and **IV**
4. **I, II, III** and **IV**

131 In plants, the common symptoms of viral infection can be all the following except:

1. mosaic formation
2. leaf rolling and curling
3. yellowing and vein clearing
4. smuts and rusts

132 Which of the following statements is wrong for viroids?

1. Their RNA is of high molecular weight
2. They lack a protein coat
3. They are smaller than viruses
4. They cause infections

133 Viroids differ from viruses in having

1. DNA molecules with protein coat
2. DNA molecules without protein coat
3. RNA molecules with protein coat
4. RNA molecules without protein coat

134 Potato Spindle Tuber Disease is caused by a pathogen that is:

1.	A nucleocapsid
2.	A low molecular weight free RNA
3.	An abnormally folded protein
4.	A protozoan

135 Consider the given two statements regarding viroids:

I:	Viroids were discovered by Thomas Cech in 1998.
II:	The RNA of the viroid is of a very high molecular weight.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

136 What would be true regarding the comparison of a virus and a viroid?

I:	Protein coat is absent in a viroid but is present in a virus
II:	Low molecular weight RNA is present in a virus but is absent in a viroid

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

137 Regarding viroids:

I:	They are small single-stranded, circular RNAs that are infectious pathogens.
II:	The first recognized viroid was the Potato spindle tuber viroid, abbreviated PSTVd.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

138 Prion is:

1. A nucleocapsid
2. A low molecular weight free RNA
3. An abnormally folded protein
4. A protozoan

139 The disease caused by prions in humans is known as:

1. Bovine spongiform encephalopathy
2. Scrapie
3. CJD [Creutzfeldt Jakob Disease]
4. Infectious mononucleosis

140 How is a prion different from viroids, viruses, bacteria, fungi, and parasites?

1. It is non-infectious
2. It is obligate intracellular parasite
3. It is devoid of nucleic acids
4. It is a low molecular weight RNA molecule

141 Mycobiont and Phycobiont are formed in

1.	Mycorrhzia	2.	Root
3.	Lichens	4.	BGA

142 In the symbiotic relation lichen, the mycobiont does not:

1. prepare food for the other partner
2. provide shelter to the other partner
3. absorb mineral nutrients for the other partner
4. absorb water for the other partner

143 Consider the given two statements:

Statement I:	The algal component in lichen is known as phycobiont and fungal component as mycobiont, which are autotrophic and heterotrophic, respectively.
Statement II:	Lichens are very good pollution indicators – they grow profusely in polluted areas.

1. **Statement I** is correct; **Statement II** is correct
2. **Statement I** is correct; **Statement II** is incorrect
3. **Statement I** is incorrect; **Statement II** is correct
4. **Statement I** is incorrect; **Statement II** is incorrect

144 All the following will be true for Lichens except:

1.	They are placed in Monera in Whittaker's classification.
2.	They are good indicators of environmental pollution.
3.	They are symbiotic associations i.e. mutually useful associations, between algae and fungi.
4.	They play an important role in primary ecological succession on the rocks.

145 Study the Assertion statement followed by the Reason statement given below:

Assertion (A):	Lichens are very good pollution indicators.
Reason (R):	They grow profusely in polluted areas.

1.	**(A)** is True but **(R)** is False.
2.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
3.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
4.	**(A)** is False but **(R)** is True.

BIOLOGICAL CLASSIFICATION - ANSWER KEY

1.	**(1)**	2.	**(1)**	3.	**(4)**	4.	**(1)**	5.	**(4)**	6.	**(2)**	7.	**(3)**	8.	**(1)**	9.	**(1)**	10.	**(2)**
11.	**(2)**	12.	**(4)**	13.	**(3)**	14.	**(1)**	15.	**(1)**	16.	**(1)**	17.	**(2)**	18.	**(1)**	19.	**(1)**	20.	**(2)**
21.	**(1)**	22.	**(4)**	23.	**(1)**	24.	**(3)**	25.	**(4)**	26.	**(4)**	27.	**(3)**	28.	**(3)**	29.	**(3)**	30.	**(1)**
31.	**(4)**	32.	**(3)**	33.	**(4)**	34.	**(1)**	35.	**(2)**	36.	**(2)**	37.	**(3)**	38.	**(2)**	39.	**(4)**	40.	**(4)**
41.	**(2)**	42.	**(4)**	43.	**(2)**	44.	**(1)**	45.	**(1)**	46.	**(1)**	47.	**(2)**	48.	**(2)**	49.	**(3)**	50.	**(1)**
51.	**(3)**	52.	**(2)**	53.	**(1)**	54.	**(2)**	55.	**(4)**	56.	**(3)**	57.	**(2)**	58.	**(4)**	59.	**(1)**	60.	**(4)**
61.	**(1)**	62.	**(4)**	63.	**(2)**	64.	**(2)**	65.	**(3)**	66.	**(1)**	67.	**(2)**	68.	**(4)**	69.	**(2)**	70.	**(4)**
71.	**(4)**	72.	**(4)**	73.	**(2)**	74.	**(4)**	75.	**(1)**	76.	**(2)**	77.	**(4)**	78.	**(2)**	79.	**(4)**	80.	**(3)**
81.	**(3)**	82.	**(1)**	83.	**(3)**	84.	**(4)**	85.	**(2)**	86.	**(1)**	87.	**(1)**	88.	**(1)**	89.	**(1)**	90.	**(2)**
91.	**(1)**	92.	**(3)**	93.	**(1)**	94.	**(2)**	95.	**(4)**	96.	**(4)**	97.	**(2)**	98.	**(3)**	99.	**(3)**	100.	**(1)**
101.	**(3)**	102.	**(4)**	103.	**(3)**	104.	**(4)**	105.	**(4)**	106.	**(1)**	107.	**(3)**	108.	**(3)**	109.	**(4)**	110.	**(4)**
111.	**(4)**	112.	**(3)**	113.	**(4)**	114.	**(3)**	115.	**(4)**	116.	**(3)**	117.	**(3)**	118.	**(3)**	119.	**(3)**	120.	**(3)**
121.	**(2)**	122.	**(1)**	123.	**(2)**	124.	**(2)**	125.	**(1)**	126.	**(4)**	127.	**(1)**	128.	**(1)**	129.	**(1)**	130.	**(2)**
131.	**(4)**	132.	**(1)**	133.	**(4)**	134.	**(2)**	135.	**(4)**	136.	**(1)**	137.	**(3)**	138.	**(3)**	139.	**(3)**	140.	**(3)**
141.	**(3)**	142.	**(1)**	143.	**(2)**	144.	**(1)**	145.	**(1)**										

INTRODUCTION

1 Regarding artificial system of classification of living organisms:

I:	It is the most acceptable system for classification of living organisms.
II:	The vegetative characters are more easily affected by environment.

1. **I** is correct and **II** is incorrect
2. Both **I** and **II** are correct and **II** explains **I**
3. **I** is incorrect and **II** is correct
4. Both **I** and **II** are correct but **II** does not explain **I**

2 The system of classification of plants given by Carolus Linnaeus was:

1.	an artificial system based mainly on the androecium structure.
2.	a natural system based on large number of natural affinities between flowering plants.
3.	was a phylogenetic system based on evolutionary relationships.
4.	was a chemotaxonomic system based on structure of homologous proteins.

3 Consider the given two statements:

Assertion (A):	Equal weightage to vegetative and sexual characteristics in the artificial systems is not acceptable.
Reason (R):	The sexual characters are more easily affected by environment.

1.	Both **(A)** and **(R)** are True and **(R)** explains **(A)**
2.	Both **(A)** and **(R)** are True and **(R)** does not explain **(A)**
3.	**(A)** is True but **(R)** is False
4.	**(A)** is False but (R) is True

4 Consider the given two statements:

Assertion(A):	Artificial systems of classification of organisms are simple and acceptable to most scientists.
Reason (R):	Artificial classification systems take into account the evolutionary relationships between living organisms.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A).**
3.	**(A)** is True; **(R)** is False
4.	Both **(A)** and **(R)** are False

5 Which statement accurately describes the difference between artificial and natural systems of classification?

1.	Artificial systems utilize genetic similarities, whereas natural systems use morphological characteristics.
2.	Artificial systems classify organisms based on a few characteristics, while natural systems consider a large number of characteristics.
3.	Artificial systems classify organisms based on evolutionary relationships, while natural systems focus on ecological roles.
4.	Artificial systems are based on observable characteristics, while natural systems are more theoretical.

6 Consider the two statements:

Statement I:	Classification for flowering plants given by George Bentham and Joseph Dalton Hooker is a natural system of classification.
Statement II:	Classification for flowering plants given by Linnaeus is an artificial system of classification.

1. **Statement I** is correct; **Statement II** is correct
2. **Statement I** is incorrect; **Statement II** is correct
3. **Statement I** is correct; **Statement II** is incorrect
4. **Statement I** is incorrect; **Statement II** is incorrect

7 The classification based on the premise that organisms belonging to the same taxa have a common ancestor is called as:

1. Cytotaxonomy
2. Phylogenetic system
3. Chemotaxonomy
4. Numerical taxonomy

8 Match each item in Column I with one in Column II and select the correct match as your answer from the coders given:

	Column I [Classification method]		**Column II [Feature used]**
A.	Artificial	P.	Evolutionary relationships
B.	Phylogenetic	Q.	Gross morphological characters
C.	Chemotaxonomy	R.	Chemical constituents of plants
D.	Cytotaxonomy	S.	Chromosome number, structure and behaviour

Codes

	A	B	C	D
1.	P	Q	S	R
2.	Q	P	R	S
3.	R	S	P	Q
4.	S	R	Q	P

9 In numerical taxonomy:

I:	computers are used and all the observable characters are taken into consideration.
II:	hundreds of characters can be considered together and each character is given equal importance.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. both **I** and **II** are incorrect

10 Identify the incorrectly matched pair:

1.	Phylogenetic classification systems	Based on evolutionary relationships
2.	Numerical Taxonomy	Based on all observable characteristics
3.	Cytotaxonomy	Based on a few vegetative characters only.
4.	Chemotaxonomy	Uses the chemical constituents of the plant

ALGAE

11 Identify the incorrect statement regarding algae:

1.	Algae contain chlorophyll
2.	Algae are autotrophic
3.	Body of an alga is composed of pseudoparenchyma and hyphae
4.	Cell wall of an alga is composed of true cellulose.

12 Which of the following options most accurately describes algae in general?

1.	Algae are chlorophyll-bearing, thalloid, autotrophic and largely aquatic (both fresh water and marine) organisms.
2.	Algae are chlorophyll-bearing, having highly differentiated body, autotrophic and exclusively found in fresh water organisms.
3.	Algae are chlorophyll-bearing or parasitic heterotrophic organisms, thalloid and largely marine organisms.
4.	Algae are chlorophyll-lacking, thalloid, autotrophic and largely saprophytic organisms found in both fresh and marine waters.

13 The form and size of algae is highly variable. Which of the following will not be true?

I:	*Volvox* is a colonial alga.
II:	*Ulothrix* and *Spirogyra* do not form filaments.
III:	Kelps form massive plants bodies.

1. Only **II**	2. Only **III**
3. Both **I** and **II**	4. Both **II** and **III**

14 Which of the following statements is true about zoospores and gametes in brown algae?

1.	Both zoospores and gametes in brown algae are motile and have equal sized flagella.
2.	Zoospores are non-motile while gametes are motile, both lacking flagella.
3.	Zoospores are motile with two flagella, while gametes are non-motile.
4.	Zoospores and gametes are both motile and similar in the number of flagella.

15 Identify the incorrectly matched pair:

	Alga	Sexual reproduction
I:	*Ulothrix*	Isogamous; non-flagellated gametes
II:	*Spirogyra*	Isogamous; flagellated gametes
III:	*Udorina*	Anisogamous
IV:	*Fucus*	Oogamous

1.	Only **III**	2.	**I, II** and **III**
3.	Only **I** and **II**	4.	Only **III** and **IV**

16 Identify the correct statements:

I:	Gametes are flagellated and similar in size in *Ulothrix*
II:	Gametes are non-flagellated and similar in size in *Spirogyra*
III:	Gametes are dissimilar in size in *Eudorina*

1. Only **I** and **II**
2. Only **I** and **III**
3. Only **II** and **III**
4. **I, II** and **III**

17 Sexual reproduction takes place through non flagellated gametes that are similar in size in:

1.	*Ulothrix*	2.	*Spirogyra*
3.	*Volvox*	4.	*Fucus*

18 Oogamous sexual reproduction is seen in:

1.	*Ulothrix*	2.	*Spirogyra*
3.	*Udorina*	4.	*Fucus*

19 Fusion of two gametes which are dissimilar in size is termed as

1.	Oogamy	2.	Isogamy
3.	Anisogamy	4.	Zoogamy

20 Algae are useful to man in a variety of ways. Identify the correct statements:

I:	At least a half of the total carbon dioxide fixation on earth is carried out by algae through photosynthesis.
II:	They are of paramount importance as primary producers of energy-rich compounds which form the basis of the food cycles of all aquatic animals.
III:	Many species of *Porphyra, Laminaria* and *Sargassum* are among the 70 species of marine algae used as food.
IV:	Agar, one of the commercial products obtained from *Gelidium* and *Gracilaria,* are used to grow microbes and in preparations of ice-creams and jellies.
V:	*Chlorella,* a multicellular alga rich in proteins, is used as food supplement even by space travellers.

1. Only **I, II, III** and **IV**
2. Only **I, II, IV** and **V**
2. Only **I, II** and **III**
4. Only **II, III** and **IV**

21 Which of the following is not an example of an edible alga?

1.	*Porphyra*	2.	*Laminaria*
3.	*Sargassum*	4.	*Amanita*

22 Consider the given statements:

I:	Algin is a hydrocolloid derived from brown algae
II:	Carrageen is a hydrocolloid derived from green algae
III:	Agar is a complex polysaccharide derived from red algae, *Gelidium* and *Gracilaria*

1. **I** is correct; **II** is incorrect; **III** is incorrect
2. **I** is incorrect; **II** is correct; **III** is correct
3. **I** is incorrect; **II** is correct; **III** is incorrect
4. **I** is correct; **II** is incorrect; **III** is correct

23 One of the commercial products obtained from *Gelidium* and *Gracilaria* and which is used to grow microbes and in preparations of ice-creams and jellies is:

1. Agar
2. Algin
3. Carrageen
4. Inulin

24 Consider the two statements regarding *Chlorella*:

Statement I:	It is single-celled green algae.
Statement II:	It is used as a food supplement.

1. **Statement I** is correct but **Statement II** is incorrect
2. **Statement I** is incorrect but **Statement II** is correct
3. **Statement I** and **Statement II** are correct
4. **Statement I** and **Statement II** are incorrect

CHLOROPHYCEAE

25 Which of the following will not be true for members of chlorophyceae?

1.	The photosynthetic pigments are located within definite chloroplasts.
2.	Chloroplasts are discoid in shape in all members of chlorophyceae.
3.	Most of the members have one or more storage bodies called pyrenoids, which contain proteins besides starch, located in the chloroplasts.
4.	Some green algae may store food in the form of oil droplets.

26 Pyrenoids:

I:	are found in chloroplasts of many algae.
II:	contain protein besides starch.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

27 Green algae usually have a rigid cell wall made of:

1.	an inner layer of cellulose and an outer layer of pectose
2.	an inner layer of pectose and an outer layer of cellulose
3.	an inner layer of cellulose and an outer layer of lignin
4.	an inner layer of cellulose and an outer layer of chitin

28 In Chlorophyceae:

I:	Vegetative reproduction is not seen.
II:	Asexual reproduction is by flagellated zoospores.
III:	Sexual reproduction is always oogamous.

1. Only **I** and **III** are correct
2. Only **II** is correct
3. Only **I** and **II** are correct
4. **I, II** and **III** are correct

29 All the following are example of green alga except:

1. *Ectocarpus*
2. *Chara*
3. *Ulothrix*
4. *Spirogyra*

30 All the following will be correct for members of Chlorophyceae except:

1.	Chlorophyll a and Chlorophyll b are dominant photosynthetic pigments
2.	Pyrenoids seen in chloroplasts in most
3.	Cellulosic cell wall
4.	2 unequal and lateral flagellar insertions

31 Which of the following feature given in column I is not correctly matched with its correct description given in Column II with respect to members of Chlorophyceae?

	Column I	**Column II**
1.	Main photosynthetic pigment	Chlorophyll a, b
2.	Cell wall	Inner layer of cellulose and outer layer of pectose
3.	Stored food	Starch
4.	Flagellar number and insertion	2-8. unequal. basal

PHAEOPHYCEAE

32 Regarding the size and form of brown algae:

I:	*Ectocarpus* is profusely branched and may reach a height of 100 meters.
II:	Kelps are simple branched filamentous brown algae.

1. Both **I** and **II** are incorrect
2. Only **I** is incorrect
3. Only **I** is correct
4. Both **I** and **II** are correct

33 All the following will be correct for members of Phaeophyceae except:

1.	Chlorophyll a and Chlorophyll c are dominant photosynthetic pigments
2.	Pyriform gametes
3.	Floridean starch is the stored food
4.	2 unequal and lateral flagellar insertions

34 The members of phaeophyceae or brown algae;

1.	are found primarily in fresh water habitats.
2.	possess chlorophyll a, c, carotenoids and xanthophylls.
3.	store food as glycogen.
4.	do not reproduce asexually.

35 Identify the algal group:

I:	They possess chlorophyll a, c, carotenoids and xanthophylls.
II:	Food is stored as complex carbohydrates, which may be in the form of laminarin or mannitol.

1. Green algae
2. Brown algae
3. Red algae
4. Blue-green algae

36 A root like holdfast, a stem like stipe and a leaf like frond constitutes the plant body in case of

1.	Rhodophyceae	2.	Chlorophyceae
3.	Phaeophyceae	4.	Ferns

37 The leaf like photosynthetic organ in the body of a typical brown alga is called as:

1.	Frond	2.	Stipe
3.	Holdfast	4.	Rhizoid

38 Biflagellate zoospores that are pear-shaped and have two unequal laterally attached flagella are involved in:

1.	Asexual reproduction in brown algae
2.	Asexual reproduction in red algae
3.	Sexual reproduction in brown algae
4.	Sexual reproduction in red algae

39 In brown algae:

I.	Asexual reproduction is by biflagellate zoospores that are pear shaped and have two unequal and laterally attached flagella.
II.	The gametes are pyriform [pear shaped] and bear two laterally attached flagella.

1. Both **I** and **II** are incorrect
2. Only **I** is incorrect
3. Only **I** is correct
4. Both **I** and **II** are correct

40 All the following belong to phaeophyceae except:

1. *Ectocarpus*
2. *Polysiphonia*
3. *Dictyota*
4. *Laminaria*

41 The cell wall of the cells of an alga has cellulose and algin. Another feature expected in this alga would be:

1.	Floridean starch as stored food
2.	Phycoerythrin in addition to chlorophyll a, c
3.	2, unequal, lateral flagellar insertions
4.	Polysulphate esters in cell wall

42 Which of the following features is characteristic of brown algae?

1.	Presence of chlorophyll a and c, and fucoxanthin
2.	Cell walls made up entirely of cellulose
3.	Predominantly found in terrestrial habitats
4.	Absence of flagella in all life cycle stages

RHODOPHYCEAE

43 Which of the following is not a feature of Red Algae?

1. r-phycoerythrin is a major pigment.
2. Floridean starch is stored food.
3. Cell wall contains poly sulphate esters.
4. There are 2, unequal, lateral flagellar insertions.

44 A species of red algae has been discovered near Bahamas at a depth of more than 260 m. This unusual feat is possible because this alga:

1. lacks pigmentation and functions heterotrophically as parasite on other plants
2. has significant amount of phycoerythrin in addition to chlorophyll a and d
3. unlike other red algae has flagellated gametes
4. it has large number of root like rhizoids enabling it to attach to a deep substratum

45 Which of the following will not be true for the members of Rhodophyceae?

1. Chlorophyll a, d, and Phycoerythrin are present.
2. Stored food is Floridean starch.
3. Cell wall is cellulosic, having pectin and polysulphate esters.
4. Flagellar number and position of insertions is two unequal and lateral, respectively.

46 In red algae:

I:	Phycoerythrin is a major photosynthetic pigment.
II:	Floridean starch is stored food.
III:	Cell wall contains polysulphate esters.
IV:	Flagella are 2, unequal with lateral insertion.

1. Only **I**, **II** and **III** are correct
2. Only **I**, **III** and **IV** are correct
3. Only **II**, **III** and **IV** are correct
4. **I**, **II**, **III** and **IV** are correct

47 Which of the following classes of algae store food that is chemically very similar to amylopectin and glycogen?

1.	Chlorophyceae	2.	Phaeophyceae
3.	Rhodophyceae	4.	All algae

48

Statement I:	Red algae do not occur in well-lighted regions close to the surface of water.
Statement II:	Red algae reproduce by non-motile spores and non-motile gametes.

1. **Statement I** is correct; **Statement II** is correct
2. **Statement I** is correct; **Statement II** is incorrect
3. **Statement I** is incorrect; **Statement II** is correct
4. **Statement I** is incorrect; **Statement II** is incorrect

49 Sexual reproduction is oogamous and accompanied by complete post-fertilization developments in the members of:

1. Chlorophyceae
2. Phaeophyceae
3. Rhodophyceae
4. Both Chlorophyceae and Phaeophyceae

50 All the following are members of rhodophyceae except:

1.	*Polysiphonia*	2.	*Laminaria*
3.	*Gracilaria*	4.	*Gelidium*

51 What will be A, B and C in the given table?

	Stored food	Cell wall	Flagellar insertions
Green algae	Starch	A	2 – 8, equal, apical
Brown algae	B	Algin	2, unequal lateral
Red algae	C	Polysulphate esters	D

	A	B	C	D
1	Cellulose	Laminarin and Mannitol	Laminarin and Mannitol	2, unequal, apical
2	Cellulose	Laminarin and Mannitol	Floridean starch	Absent
3	Cellulose	Floridean starch	Laminarin and Mannitol	4, equal, apical or lateral
4	Algin	Floridean starch	Floridean starch	Absent

52 Red algae differ from green and brown algae in:

1.	having Chlorophyll a as main photosynthetic pigment
2.	their capability of sexual reproduction
3.	not having a well-developed nucleus
4.	lacking flagellated cells in the life cycle

53 Consider the given two statements.

A:	The pigments used by algae in photosynthesis control how deep they can live in the water.
B:	Of the green, brown, and red algae, brown algae are especially adapted for living in deep water.

1.	Only **A** is true.
2.	Only **B** is true.
3.	Both **A** and **B** are true.
4.	Both **A** and **B** are false.

54 Consider the given two statements:

Assertion (A):	Algae can reproduce by fragmentation, a type of asexual reproduction.
Reason (R):	Fragmentation involves the body of the algae breaking into pieces, each of which can develop into a complete organism.

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	**(A)** is False but **(R)** is True.

BRYOPHYTES

55 The bryophyte with most economic importance will be:

1.	peat moss	2.	liverwort
3.	hornwort	4.	*Polytrichum*

56 Consider the given two statements:

Assertion (A):	Bryophytes are also called amphibians of the plant kingdom.
Reason (R):	Bryophytes play an important role in plant succession on bare rocks/soil.

1.	Both **(A)** and **(R)** are True and **(R)** explains **(A)**
2.	Both **(A)** and **(R)** are True and **(R)** does not explain **(A)**
3.	**(A)** is True but **(R)** is False
4.	**(A)** is False but **(R)** is True

57 Thallus like plant body, attached to substratum by rhizoids, requiring water for sexual reproduction and a dominant gametophyte characterise:

1.	Pteridophytes	2.	Gymnosperms
3.	Monocots	4.	Bryophytes

58 Regarding bryophytes:

I:	The main plant body is haploid.
II:	The sex organs are multicellular.
III:	The sporophyte is not free-living.

1. Only **I** and **II** are correct
2. Only **I** and **III** are correct
3. Only **II** and **III** are correct
4. **I**, **II** and **III** are correct

59 Antheridium of bryophytes produce ______ antherozoids.

1. Non-motile
2. Uni-flagellate
3. Biflagellate
4. Ciliate

60 All the following are characteristics of bryophytes except:

1. spore producing
2. dominant gametophyte
3. lignified tissues
4. producing antheridium and archegonium

61 How many of the given statements regarding sexual reproduction in Bryophytes are true?

I:	The sex organs in bryophytes are multicellular.
II:	The male sex organ is called antheridium and they produce biflagellate antherozoids.
III:	The female sex organ called archegonium is flask-shaped and produces a single egg.
IV:	The antherozoids are released into water where they come in contact with archegonium.
V:	Zygotes undergo reduction division immediately.

1. 2
2. 3
3. 4
4. 5

62 Which of the following statement will not be true regarding bryophytes?

1. They are dependent on water for sexual reproduction.
2. Archegonium is flask shaped and produces multiple eggs.
3. Sporophyte is attached to the photosynthetic gametophytes and derives nourishment from it.
4. The antherozoids are released into water.

63 In bryophytes:

I:	Zygotes undergo reduction division immediately.
II:	The sporophyte is not free-living but attached to the photosynthetic gametophyte and derives nourishment from it.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

64 Study the Assertion statement followed by the Reason statement given below:

Assertion (A):	Peat moss is used as packing material for trans-shipment of living material.
Reason (R):	Peat moss has a good capacity to hold water.

1. **(A)** is True and **(R)** is False.
2. Both **(A)** and **(R)** are True and **(R)** is a correct explanation of **(A)**.
3. Both **(A)** and **(R)** are True but **(R)** is not a correct explanation of **(A)**.
4. **(A)** is False and **(R)** is True.

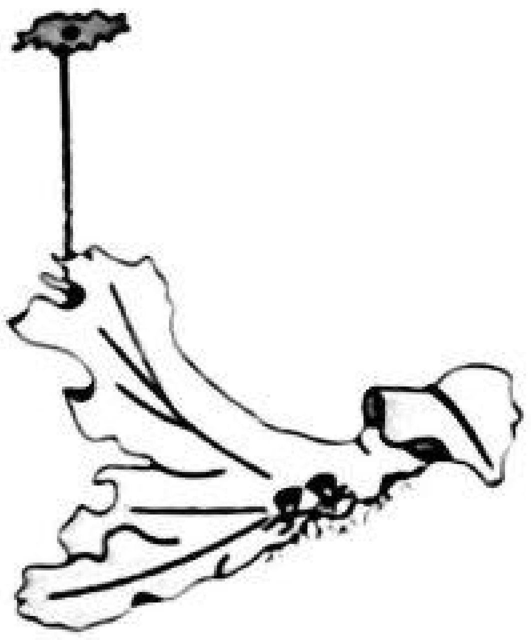
65 Consider the two statements:

Statement I:	Bryophytes usually occur in damp, humid and shaded localities and are not truly 'successful' on land.
Statement II:	They are dependent on water for sexual reproduction.

1. **Statement I** is correct and **Statement II** is incorrect
2. Both **Statement I** and **Statement II** are correct and **Statement II** explains **Statement I**
3. **Statement I** is incorrect and **Statement II** is correct
4. Both **Statement I** and **Statement II** are correct but **Statement II** does not explain **Statement I**

LIVERWORTS

66 The given diagram shows:



1. Female thallus of *Marchantia*
2. Male thallus of *Marchantia*
3. Female thallus of *Funaria*
4. Male thallus of *Funaria*

67 Regarding *Marchantia*:

I:	The thallus is dorsi-ventral and closely appressed to the substrate.
II:	The plant is monoecious.

1.	Both **I** and **II** are incorrect
2.	Only **I** is incorrect
3.	Only **I** is correct
4.	Both **I** and **II** are correct

68 In liverworts:

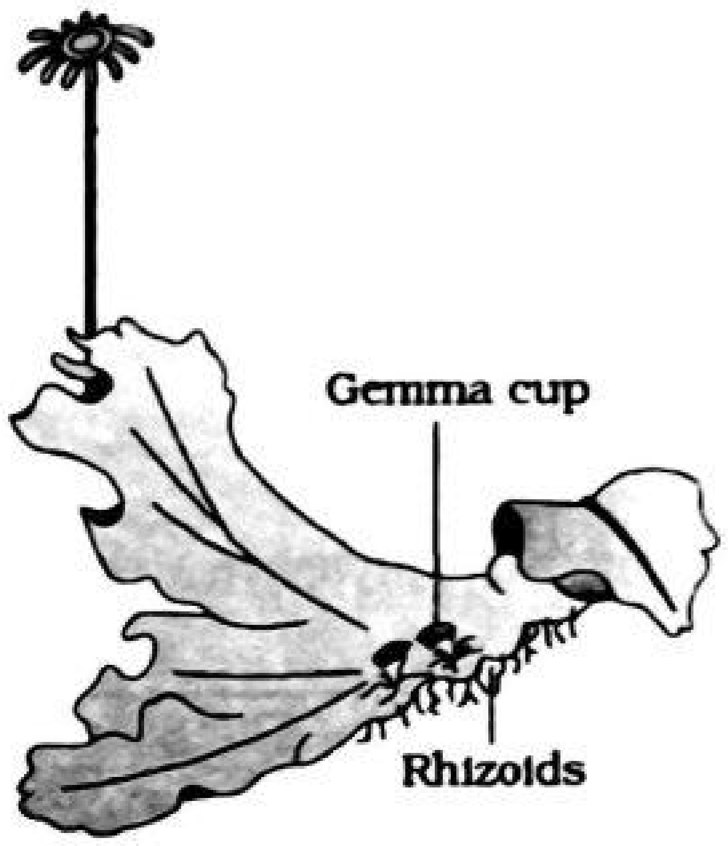
I:	Asexual reproduction is not seen.
II:	Sexual reproduction takes place by multicellular gemmae.

1. Both **I** and **II** are incorrect
2. Only **I** is incorrect
3. Only **I** is correct
4. Both **I** and **II** are correct

69 Gemmae are present in:

1.	Some Gymnosperms	2.	Some Liverworts
3.	Mosses	4.	Pteridophytes

70 The given diagram shows:



1. Female gametophyte of *Marchantia*
2. Male gametophyte of *Marchantia*
3. Female gametophyte of *Funaria*
4. Male gametophyte of *Funaria*

MOSSES

71 How many of the given statements regarding the life cycle of mosses are true?

I:	The predominant stage of the life cycle of a moss is the gametophyte.
II:	Protonema stage develops directly from a spore.
III:	Leafy stage bears the sex organs.

1. 0
2. 1
3. 2
4. 3

72 Protonema is a stage in the life cycle that is:

1. Haploid and is found in mosses
2. Diploid and is found in liverworts
3. Diploid and is found in pteridophytes
4. Haploid and is found in pteridophytes

73 The leafy stage in the life cycle of a moss:

1. develops from the primary protonema.
2. consists of upright, slender axes bearing spirally arranged leaves.
3. is attached to the soil through unicellular and unbranched rhizoids.
4. lacks the sex organs.

74 Fragmentation and budding in the secondary protonema are means of vegetative reproduction in:

1. Mosses
2. Liverworts
3. Vascular cryptogams
4. Thalloid green algae

75 In the life cycle of moss bryophytes, which stage bears the sex organs?

1. Seta of the sporophyte
2. Leafy stage
3. Capsule of the sporophyte
4. Protonema stage

76 Mosses reproduce by vegetative means through:

1. Fragmentation and budding in secondary protonema.
2. Only budding in secondary protonema but not by fragmentation in secondary protonema.
3. By adventitious root formation and budding in secondary protonema.
4. By fragmentation and budding in the sporophyte.

77 What is not true for mosses?

1. Sporophyte is less elaborate than liverworts
2. Protonema stage develops directly from a spore
3. Leafy stage develops from a secondary protonema as a lateral bud
4. They are attached to soil through multicellular and branched rhizoids

78 Consider the given statements regarding Mosses:

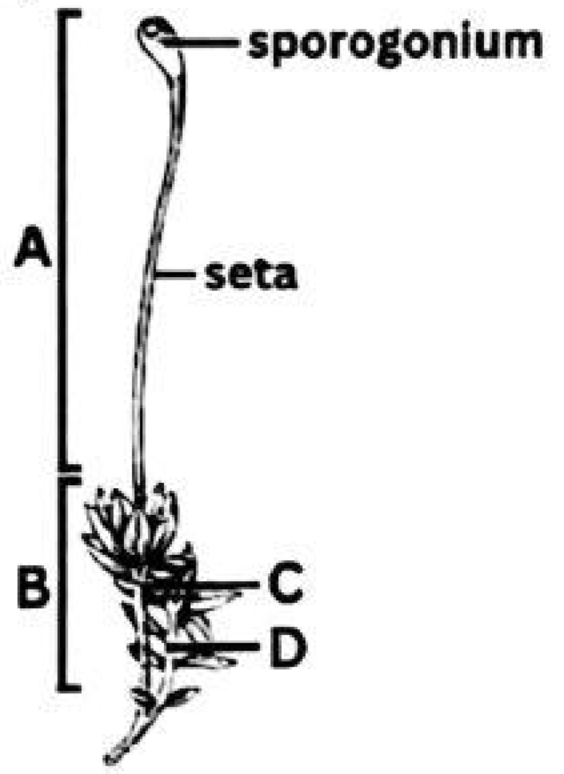
I: Protonema is a gametophyte stage that is creeping, green, branched and frequently filamentous.
II: Leafy stage bears sex organs and is attached to the soil through multicellular and branched rhizoids.
III: Sex organs are produced at the apex of the leafy shoot.
IV: They have an elaborate mechanism of spore dispersal.

1. Only **I, II** and **III** are correct
2. Only **I, III** and **IV** are correct
3. Only **II, III** and **IV** are correct
4. **I, II, III** and **IV** are correct

79 In the life cycle of a moss, the sporphytic generation is represented by all the following except:

1.	Oospore	2.	Spore
3.	Sporogonium	4.	Spore mother cell

80 In the given diagram of *Funaria*, what are A, B, C and D respectively?



1. Sporophyte, Gametophyte, Female branch, Male branch
2. Gametophyte, Sporophyte, Female branch, Male branch
3. Sporophyte, Gametophyte, Male branch, Female branch
4. Gametophyte, Sporophyte, Male branch, Female branch

81 Sporophyte is differentiated into a foot, a seta and a capsule in:

I. Liverworts
II. Mosses

1. Only **I**	2. Only **II**
3. Both **I** and **II**	4. Neither **I** nor **II**

82 All the following bryophytes are 'Mosses' except:

1.	*Funaria*	2.	*Marchantia*
3.	*Polytrichum*	4.	*Sphagnum*

PTERIDOPHYTES

83 Evolutionarily, the first terrestrial plants to possess vascular tissues are:

1.	Bryophytes	2.	Pteridophytes
3.	Gnetales	4.	Cycads

84 Identify the incorrect statement:

1.	As compared to the bryophytes, pteridophytes have sporophyte as the main plant body
2.	Pteridophyte sporophyte has well differentiated true roots, stem and leaves
3.	*Selaginella* has macrophylls like ferns
4.	In sporophyte of ferns, leaf-like appendages called sporophylls subtend sporangia

85 In pteridophytes:

I:	the main plant body is a gametophyte
II:	body is differentiated into true root, stem and leaves
III:	organs possess well-differentiated vascular tissues

1. Only **I** and **II** are correct
2. Only **I** and **III** are correct
3. Only **II** and **III** are correct
4. **I, II** and **III** are correct

86 The leaves in pteridophyta are:

1. microphylls in *Selaginella* or macrophylls in ferns.
2. macrophylls in *Selaginella* or microphylls in ferns.
3. microphylls in *Selaginella* and ferns.
4. macrophylls in *Selaginella* and ferns.

87 In *Selaginella* and *Equisetum*:

1.	spores produced are of one kind.
2.	heterospory is seen.
3.	gametophyte is the dominant generation in the life cycle.
4.	sporophylls form distinct compact structures called strobili or cones.

88 A prothallus is

1.	A structure in pteridophytes formed before the thallus develops
2.	A sporophytic free living structure formed in pteridophytes
3.	A gametophyte free living structure formed in pteridophytes
4.	A primitive structure formed after fertilization in pteriodophytes

89 Consider the following two statements:

I:	The spread of living pteridophytes is restricted to narrow geographical regions
II:	They are the first terrestrial plants to possess vascular tissues

1. Both **I** and **II** are correct and **II** explains **I**
2. Both **I** and **II** are correct but **II** does not explain **I**
3. **I** is true but **II** is false
4. **I** is false but **II** is true

90 Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R):

Assertion (A):	The spread of living pteridophytes is limited and restricted to narrow geographical regions.
Reason (R):	Evolutionarily, pteridophytes are the first terrestrial plants to possess vascular tissues – xylem and phloem.

In the light of the above statements choose the correct answer from the options given below:

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	Both **(A)** and **(R)** are False.

91 A plant has a diploid sporophyte as the dominant, independent, photosynthetic, vascular body. It alternates with multicellular, saprophytic/autotrophic, independent but short-lived haploid gametophyte. This plant most likely belongs to:

1.	Red algae	2.	Bryophytes
3.	Pteridophytes	4.	Gymnosperms

92 In majority of the pteridophytes:

I:	transfer of male gamete to the female gamete does not require water
II:	all the spores are of similar kinds

1. Both **I** and **II** are correct
2. Both **I** and **II** are incorrect
3. Only **I** is correct
4. Only **II** is correct

93 Consider the given two statements:

Assertion (A):	Ferns exhibit an alternation of generations where the gametophyte is dominant.
Reason (R):	In ferns, the gametophyte is independent and photosynthetic but smaller and less complex than the sporophyte.

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**
3.	**(A)** is True but **(R)** is False.
4.	**(A)** is False but **(R)** is True.

94 Genera like *Selaginella* and *Salvinia*:

1. do not possess vascular tissues
2. have a dominant gametophyte in their life cycle
3. produce two kinds of spores
4. have macrophylls

95 Consider the following two statements:

I:	In *Selaginella* and *Salvia*, development of zygotes into young embryos takes place within the female gametophyte.
II:	*Selaginella* and *Salvia* are homosporous pteridophytes

1. Both **I** and **II** are correct and **II** explains **I**
2. Both **I** and **II** are correct but **II** does not explain **I**
3. **I** is true but **II** is false
4. **I** is false but **II** is true

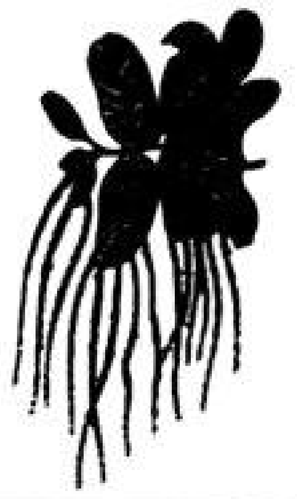
96 Consider the following statements:

I:	Pteridophytes are the first terrestrial plants to possess vascular bundles.
II:	Main plant body in pteridophytes is sporophyte which is differentiated into true stem and leaves.
III:	Genera like *Selaginella* and *Salvinia* are heterosporous.

Which of the above statements are true?

1.	**I** and **II** only	2.	**I** and **III** only
3.	**II** and **III** only	4.	**I, II** and **III**

97 The given diagram shows :

1. An alga that lacks flagellated cells 2. A liverwort 3. A heterosporous pteridophyte 4. A gymnosperm with non motile sperms	

98 Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R):

Assertion (A):	Heterospory in some pteridophytes paved the way for the evolution of seeds in higher plants.
Reason (R):	The megaspores and microspores in heterosporous ferns give rise to female and male gametophytes respectively.

In the light of the above statements choose the correct answer from the options given below:

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	**(A)** is False but **(R)** is True.

99 Identify the incorrectly matched pair:

	Pteridophyte class	Example
1.	Psilopsida	*Adiantum*
2.	Lycopsida	*Lycopodium*
3.	Sphenopsida	*Equisetum*
4.	Pteropsida	*Dryopteris*

GYMNOSPERMS

100 Which of the following Greek root word means "naked" and hence gives name to plants like cycas and pines?

1.	angeion	2.	sperm
3.	gymnos	4.	gynos

101 In gymnosperms, the ovules are:

1.	not enclosed by any ovary wall before and after fertilization
2.	not enclosed by any ovary wall only before fertilization
3.	not enclosed by any ovary wall only after fertilization
4.	enclosed by an ovary wall before and after fertilization

102 The giant Redwood tree (*Sequoia sempervirens*) is a/an

1.	Angiosperm	2.	Free fern
3.	Pteridophyte	4.	Gymnosperm

103 Coralloid roots in *Cycas* are associated with nitrogen fixing:

1.	*Rhizobium*	2.	*Frankia*
3.	*Azospirillum*	4.	Cyanobacteria

104 All the following regarding *Pinus* are correct except:

1. Obligate association with mycorrhiza
2. Unbranched stems
3. Male and female strobili on the same plant
4. Leaves in fascicles

105 Consider the given two statements:

Statement I:	In *Cycas*, the pinnate leaves persist for a few years.
Statement II:	In conifers, the needle-like leaves reduce the surface area helping to reduce water loss.

1. **Statement I** is correct but **Statement II** is incorrect
2. **Statement I** is incorrect but **Statement II** is correct
3. **Statement I** and **Statement II** are correct
4. **Statement I** and **Statement II** are incorrect

106 *Cycas* does not have:

I.	Coralloid roots
II.	Branched stems
III.	Pinnate persistent leaves
IV.	Male cones and megasporophylls borne on same plant

1. **I** and **II** only
2. **I** and **IV** only
3. **II** and **IV** only
4. **I** and **III** only

107 Identify the incorrect statement:

1.	The gymnosperms are heterosporous.
2.	Spores in gymnosperms are produced within sporangia.
3.	Sporangia in gymnosperms are borne on sporophylls which are arranged spirally along an axis to form lax or compact strobili or cones.
4.	Male strobili in gymnosperms are called macrosporangiate.

108 The terms that can be applied to all gymnosperms include:

1.	Naked seeds, Homosporous, Dominant independent sporophyte
2.	Seeds enclosed in ovary wall, Heterosporous, Dominant independent sporophyte
3.	Naked seeds, Heterosporous, Dominant independent sporophyte
4.	Naked seeds, Heterosporous, Dominant independent gametophyte

109 Female sex organs of gymnosperms are called:

1.	Archegonia	2.	Female strobili
3.	Megasporangium	4.	Megasporophyll

110 Plants of this group are diploid and well adapted to extreme conditions. They grow bearing sporophylls in compact structures called cones. The group in reference is

1.	Monocots	2.	Dicots
3.	Pteridophytes	4.	Gymnosperms

111 How many of the comparisons between Pinus and Cycas given below are correct:

	Pinus	*Cycas*
I:	Coralloid roots	Mycrorrhizal associations
II:	Stems are branched	Stems are unbranched
III:	The male or female cones or strobili are borne on different trees	The male or female cones or strobili are borne on the same tree

1. 0
2. 2
3. 1
4. 3

112 What would be true for both *Cycas* and *Pinus*?

1.	*Cycas* is a gymnosperm and *Pinus* is a pteridophyte
2.	The gametophyte is dominant in the life cycle of *Cycas* and the sporophytes is dominant in the life cycle of *Pinus*
3.	Roots of *Pinus* have mycorrhiza association and coralloid roots of *Cycas* are associated with nitrogen-fixing cyanobacteria
4.	In *Pinus*, the male and female cones are borne on different trees and in *Cycas* on the same tree

113 Which structure is involved in the reproduction of gymnosperms?

1. Flowers
2. Cones
3. Sporangia
4. Sori

114 The reduced male gametophyte in a gymnosperm is called a:

1. pollen grain
2. microsporangium
3. microsporophyll
4. antheridium

115 In gymnosperms, pollen grains:

1.	develop outside microsporangia
2.	are a result of mitosis in certain pollen mother cells
3.	are carried in air currents
4.	do not form pollen tubes and the male gamete is released into water

116 Consider the given two statements.

Statement I:	In gymnosperms, the megasporangium develops into a multicellular female gametophyte that bears two or more archegonia.
Statement II:	In gymnosperms, archegonia are the female sex organs.

1. Only **Statement I** is correct.
2. Only **Statement II** is correct.
3. Both **Statement I** and **Statement I** are correct.
4. Both **Statement I** and **Statement II** are incorrect.

117 Unlike in bryophytes and pteridophytes, in gymnosperms:

1.	vascular bundles are not present and hence they are limited to shady and moist habitats.
2.	water is needed for fertilisation and seed formation does not take place.
3.	all members are homosporous.
4.	the male and female gametophytes do not have an independent free-living existence.

PLANT KINGDOM - ANSWER KEY

1.	**(3)**	2.	**(1)**	3.	**(3)**	4.	**(4)**	5.	**(2)**	6.	**(1)**	7.	**(2)**	8.	**(2)**	9.	**(3)**	10.	**(3)**
11.	**(3)**	12.	**(1)**	13.	**(1)**	14.	**(4)**	15.	**(3)**	16.	**(4)**	17.	**(2)**	18.	**(4)**	19.	**(3)**	20.	**(1)**
21.	**(4)**	22.	**(4)**	23.	**(1)**	24.	**(3)**	25.	**(2)**	26.	**(3)**	27.	**(1)**	28.	**(2)**	29.	**(1)**	30.	**(4)**
31.	**(4)**	32.	**(1)**	33.	**(3)**	34.	**(2)**	35.	**(2)**	36.	**(3)**	37.	**(1)**	38.	**(1)**	39.	**(4)**	40.	**(2)**
41.	**(3)**	42.	**(1)**	43.	**(4)**	44.	**(2)**	45.	**(4)**	46.	**(1)**	47.	**(3)**	48.	**(3)**	49.	**(3)**	50.	**(2)**
51.	**(2)**	52.	**(4)**	53.	**(1)**	54.	**(1)**	55.	**(1)**	56.	**(2)**	57.	**(4)**	58.	**(4)**	59.	**(3)**	60.	**(3)**
61.	**(3)**	62.	**(2)**	63.	**(2)**	64.	**(2)**	65.	**(2)**	66.	**(2)**	67.	**(3)**	68.	**(1)**	69.	**(2)**	70.	**(1)**
71.	**(4)**	72.	**(1)**	73.	**(2)**	74.	**(1)**	75.	**(2)**	76.	**(1)**	77.	**(1)**	78.	**(4)**	79.	**(2)**	80.	**(1)**
81.	**(3)**	82.	**(2)**	83.	**(2)**	84.	**(3)**	85.	**(3)**	86.	**(1)**	87.	**(4)**	88.	**(3)**	89.	**(2)**	90.	**(2)**
91.	**(3)**	92.	**(4)**	93.	**(4)**	94.	**(3)**	95.	**(3)**	96.	**(4)**	97.	**(3)**	98.	**(2)**	99.	**(1)**	100.	**(3)**
101.	**(1)**	102.	**(4)**	103.	**(4)**	104.	**(2)**	105.	**(3)**	106.	**(3)**	107.	**(4)**	108.	**(3)**	109.	**(1)**	110.	**(4)**
111.	**(3)**	112.	**(3)**	113.	**(2)**	114.	**(1)**	115.	**(3)**	116.	**(3)**	117.	**(4)**						

BASIS OF CLASSIFICATION

1 Which of the following characteristics is used as a basis for the classification of animals into different phyla?

1. Presence of feathers
2. Mode of reproduction
3. Type of respiratory system
4. Body plan and symmetry

2 On what basis are animals classified in the animal kingdom?

1. Presence or absence of a coelom.
2. Type of respiratory system.
3. Habitat and niche.
4. Color and size of the animal.

3 Consider the given two statements:

Statement I:	All members of Animalia are multicellular.
Statement II:	All members of Animalia exhibit the same pattern of organisation of cells.

1. **Statement I** is correct; **Statement II** is correct
2. **Statement I** is correct; **Statement II** is incorrect
3. **Statement I** is incorrect; **Statement II** is correct
4. **Statement I** is incorrect; **Statement II** is incorrect

4 Consider the given two statements:

Statement I:	Sponges exhibit a cellular level of organization.
Statement II:	Cnidarians have a tissue level of organization.

In light of the above statements, choose the most appropriate answer from the options given below:

1. **Statement I** is correct but **Statement II** is incorrect.
2. Both **Statement I** and **Statement II** are correct.
3. Both **Statement I** and **Statement II** are incorrect.
4. **Statement I** is incorrect but **Statement II** is correct.

5 Annelids, Arthropods, Molluscs, Echinoderms and Chordates are all:

I: eucoelomates [having true coelom].

II: animals having organ system level of organisation.

1.	Only **I** is correct	2.	Only **II** is correct
3.	Both **I** and **II** are correct	4.	Both **I** and **II** are incorrect

6 Identify the correct statements:

I:	The digestive system in Platyhelminthes has only a single opening to the outside of the body that serves as both mouth and anus, and is hence called incomplete.
II:	In open type circulation, the blood is pumped out of the heart and the cells and tissues are directly bathed in it.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

7 The type of circulatory system, in which blood is circulated through a series of vessels [arteries, veins and capillaries] and never leaves the network of blood vessels, is called as:

1.	An open circulatory system	2.	A closed circulatory system
3.	A lymphatic system	4.	A portal circulation

8 Regarding bilateral symmetry:

I:	Bilateral symmetry is the body plan where the body of the animal can be divided into two identical halves through any plane passing through the central axis of the body.
II:	While Ctenophores and adult Echinoderms have bilateral symmetry, Annelida and Arthropods have radial symmetry.

In light of the above statements, choose the most appropriate answer from the options given below:

1. **Statement I** is correct but **Statement II** is incorrect.
2. Both **Statement I** and **Statement II** are correct.
3. Both **Statement I** and **Statement II** are incorrect.
4. **Statement I** is incorrect but **Statement II** is correct.

9 Consider the given two statements:

Statement I:	Coelenterates, ctenophores and echinoderms have bilateral symmetry as larvae and radial symmetry as adults.
Statement II:	Animals like annelids and arthropods exhibit bilateral symmetry.

1. **Statement I** is correct; **Statement II** is incorrect
2. **Statement I** is correct; **Statement II** is correct
3. **Statement I** is incorrect; **Statement II** is incorrect
4. **Statement I** is incorrect; **Statement II** is correct

10 The triploblastic animals differ from the diploblastic animals in having:

1.	Ectoderm	2.	Mesoderm
3.	Endoderm	4.	Gastroderm

11 Consider the two statements:

Statement I:	An undifferentiated layer, mesoglea, is present in between the ectoderm and the mesoderm in diploblastic organisms.
Statement II:	A third germinal layer, endoderm, in between the ectoderm and mesoderm, is present in triploblastic animals.

1. **Statement I** is correct; **Statement II** is correct
2. **Statement I** is incorrect; **Statement II** is correct
3. **Statement I** is correct; **Statement II** is incorrect
4. **Statement I** is incorrect; **Statement II** is incorrect

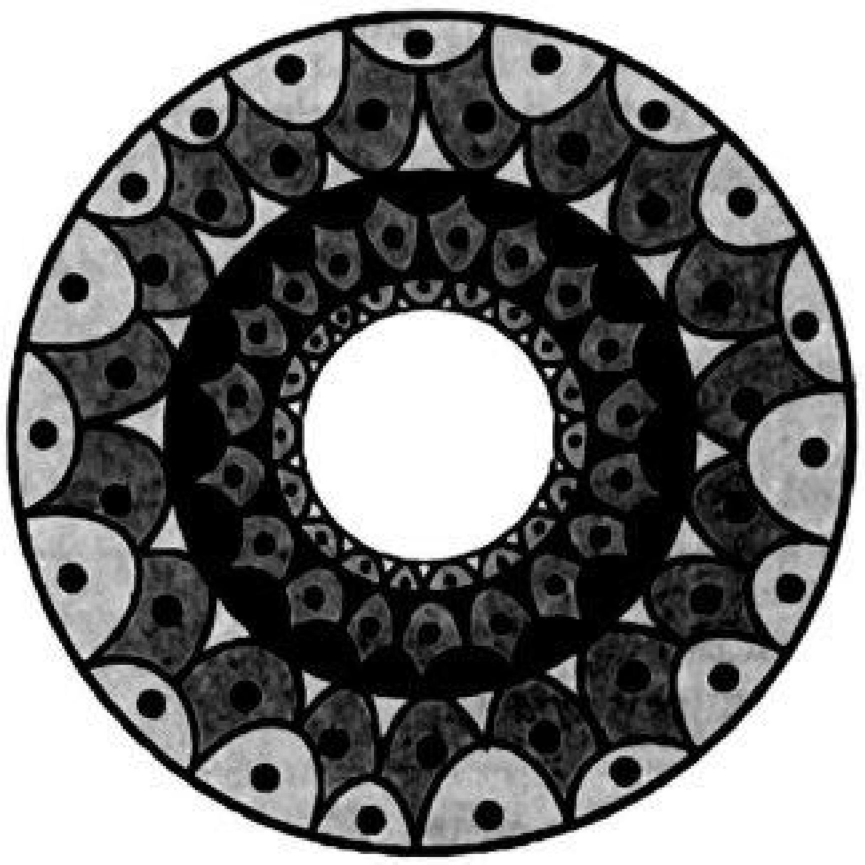
12 Consider the given features:

A:	Body cavity lined by mesoderm
B:	The mesoderm present as scattered pouches in between the ectoderm and the endoderm

Select the correct option of animals having the features A and B:

	A	B
1.	Aschelminthes	Annelids
2.	Platyhelminthes	Ctenophores
3.	Arthropods	Molluscs
4.	Arthropods	Aschelminthes

13 The body wall shown in the given figure will be seen in the members of:



1. Platyhelminthes
2. Coelenterates
3. Aschelminthes
4. Annelids

14 How many of the given statements are correct:

I:	Arthropods have true coelom.
II:	Aschelminthes have pseudocoelom.
III:	Platyhelminthes lack coelom.
IV:	A true coelom is lined on all sides by embryonic mesoderm.

1. 1
2. 2
3. 3
4. 4

15 In metameric segmentation:

I:	The body is divided into segments only externally.
II:	There is a serial repetition of at least some organs.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

16 The notochord:

I:	is derived from embryonic mesoderm.
II:	is present on the ventral side during embryonic development in chordates.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

17 The number of incorrect statement(s) from the given statements is/are:

A:	Unlike platyhelminthes, annelids have an incomplete digestive system.
B:	Unlike arthropods, annelids have an open circulatory system.
C:	Unlike aschelminthes, annelids have a pseudocoelom.
D:	Unlike chordates, the body of annelids is not metamerically segmented.

1. 0
2. 1
3. 3
4. 4

18 Which statement correctly relates to body symmetry with examples in the animal kingdom?

1.	Radial symmetry is found in annelids, allowing them to move in any direction.
2.	Bilateral symmetry is present in cnidarians like jellyfish.
3.	Bilateral symmetry is characteristic of vertebrates like humans, allowing for directional movement.
4.	Asymmetry is commonly seen in vertebrates, providing varied evolutionary advantages.

19 How many of the given statements are correct?

1.	Cnidaria and ctenophora are radially symmetrical organisms.
2.	Platyhelminthes are acoelomates.
3.	Aschelminthes are pseudocoelomates.
4.	Annelida are true coelomates.

1. 1
2. 2
3. 3
4. 4

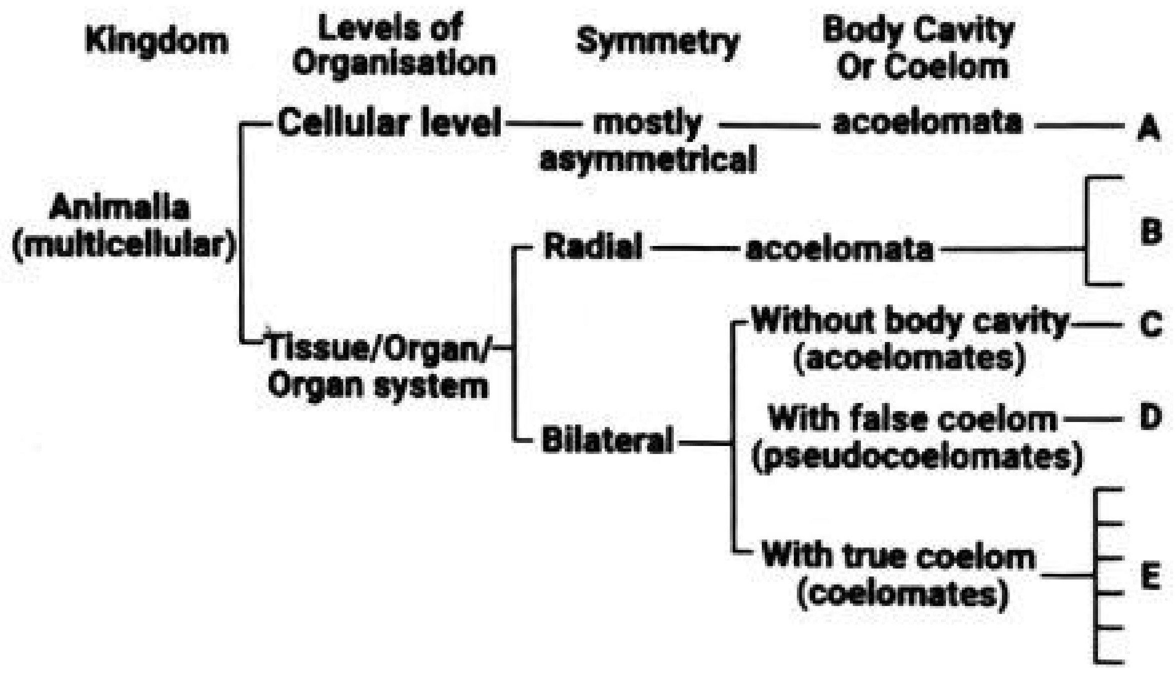
20 Consider following features:

A: Organ system level of organisation
B: Bilateral symmetry
C: True coelomates with segmentation of body

Select the correct option of animal groups which possess all the above characteristics.

1. Annelida, Mollusca and Chordata
2. Annelida, Arthropoda and Chordata
3. Annelida, Arthropoda and Mollusca
4. Arthropoda, Mollusca and Chordata

21 The given figure shows broad classification of Kingdom Animalia based on common fundamental features. Which of the following can be true based on the information given in the figure?


Kingdom
Levels of Organisation
Symmetry
Body Cavity Or Coelom
Animalia (multicellular)
Cellular level
mostly asymmetrical
acoelomata
A
Tissue/Organ/Organ system
Radial
acoelomata
B
Bilateral
Without body cavity (acoelomates)
C
With false coelom (pseudocoelomates)
D
With true coelom (coelomates)
E

a: Sponges represent 'A'
b: 'B' includes flatworms
c: Animals in 'C' are triploblastic
d: Radial symmetry is seen in adults of animals in 'D'
e: Animals in 'E' have a complete digestive system

1.	only **a**, **c** and **e**	2.	only **a**, **b** and **e**
3.	only **b** and **d**	4.	only **a**, **c** and **d**

PHYLUM PORIFERA

22 Sponges are mostly:

1.	Asymmetrical	2.	Radially symmetrical
3.	Bilateraly symmetrical	4.	Biradially symmetrical

23 Which of the following is not a feature of Porifera?

1. Exclusively marine animals
2. Presence of a water transport or a canal system
3. Sexes are not separate
4. Internal fertilization and indirect development

24 Water exits from a sponge through the:

1.	Spicule	2.	Choanocyte
3.	Amoebocyte	4.	Osculum

25 Identify the incorrect statement regarding sponges:

1.	Water enters the sponge body through ostia into a spongocoel from where it goes out through the osculum.
2.	Body is supported by a skeleton made up of spicules or spongin fibres.
3.	Sexes are not separate.
4.	Fertilization is external.

26 Name the flagellated cells that line the canals of the sponge:

1.	choanocytes	2.	porocytes
3.	pinacocytes	4.	colloblasts

27 Sponges:

I:	are exclusively marine and mostly asymmetrical animals.
II:	have cellular level of organisation.
III:	have a water transport or canal system.
IV:	have extracellular digestion.

1. Only **I** and **II** are correct
2. Only **II** and **III** are correct
3. Only **III** and **IV** are correct
4. Only **I** and **IV** are correct

28 Match each item in column I with one in column II and select the correct match from the codes given below

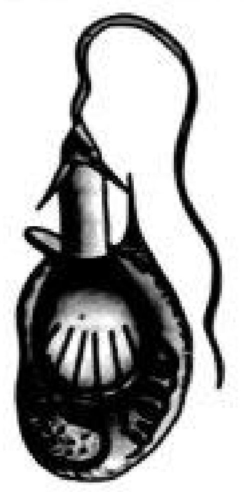
	Column I		**Column II**
A.	Sycon	P.	Scypha
B.	Spongilla	Q.	Fresh water sponge
C.	Euspongia	R.	Both sponge

Codes

	A	B	C
1.	P	Q	R
2.	R	Q	P
3.	P	R	Q
4.	Q	P	R

PHYLUM COELENTERATA

29 Regarding the cell shown in the given figure:

I: The name Cnidaria is derived from this cell	
II: The stinging capsule present in the cell is called as nematode	
III: These cells help cnidarians in anchorage, defence and in capturing the prey	

1. While I and II are correct, III is incorrect
2. I, II and III are correct
3. Only II is incorrect
4. Only I is correct

30 Identify the incorrect statement regarding animals belonging to the Phylum Cnidaria:

1.	Gastrovascular cavity has a single opening, mouth on hypostome.
2.	Corals are cnidarians and have a skeleton of calcium carbonate.
3.	They exhibit tissue level of organization and are diploblastic.
4.	Digestion is exclusively intracellular.

31 Stinging cells seen in Cnidaria that help them catch their prey and in their defence are called:

1.	Cnidoblasts	2.	Nematocysts
3.	Colloblasts	4.	Grey cells

32 Corals:

I:	are Cnidarians.
II:	have a skeleton composed of silica spicules and calcium chloride.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

33 Consider the following statements regarding basic body plans in Cnidaria:

I:	Polyp is sessile and cylindrical form as seen in *Hydra* and *Adamsia*.
II:	Medusa is umbrella-shaped and free swimming form as seen in *Aurelia*.

1.	Only **I** is correct	2.	Only **II** is correct
3.	Both **I** and **II** are correct	4.	Both **I** and **II** are incorrect

34 In *Obelia*:

a:	both polyp and medusa forms exist during its life cycle
b:	metagenesis, a sort of alternation of generation, is seen
c:	polyps produce medusae sexually and medusae form the polyps sexually

1.	only **a** is correct	2.	only **a** and **b** are correct
3.	only **c** is correct	4.	**a**, **b** and **c** are correct

35 Match each item in Column I with their correct match in Column II and select the answer from the codes given:

	Column I		Column II
A.	*Physalia*	P.	Sea-fan
B.	*Adamsia*	Q.	Sea anemone
C.	*Pennatula*	R.	Sea-pen
D.	*Gorgonia*	S.	Portuguese men of war

Codes:

	A	B	C	D
1.	S	Q	R	P
2.	S	R	Q	P
3.	P	Q	R	S
4.	S	P	Q	R

36 Consider the given two statements regarding Cnidarians:

Statement I:	The name cnidaria is derived from the cnidoblasts or cnidocytes that are collared flagellated cells involved in water transport through the body of Cnidarians.
Statement II:	Polyps are free swimming Cnidarians and Medusae are sessile Cnidarians.

1. **Statement I** is correct; **Statement II** is correct
2. **Statement I** is correct; **Statement II** is incorrect
3. **Statement I** is incorrect; **Statement II** is correct
4. **Statement I** is incorrect; **Statement II** is incorrect

37 Consider the given two statements:

Assertion (A):	Cnidarians have a body plan based on a gastrovascular cavity.
Reason (R):	Cnidarians are diploblastic animals.

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	**(A)** is False but **(R)** is True.

PHYLUM CTENOPHORA

38 The phylum with exclusively marine animals is:

1.	Porifera	2.	Cnidaria
3.	Ctenophora	4.	Platyhelminthes

39 How many of the given statements are correct regarding Ctenophores?

I:	commonly known as sea walnuts or comb jellies
II:	exclusively marine
III:	body bears eight external rows of ciliated comb plates
IV:	bioluminescence (the property of a living organism to emit light) is well-marked

1. 1
2. 2
3. 3
4. 4

40 Which animals are diploblastic and show radial symmetry but lack cnidoblasts?
1. Cnidarians
2. Ctenophores
3. Echinoderms
4. Hemichordates

41 Ctenophores:

I:	are commonly known as sea walnuts or comb jellies
II:	are exclusively marine, radially symmetrical, diploblastic organisms with tissue level of organisation
III:	use cilia for locomotion
IV:	reproduce only by sexual means

1. Only **I**, **II** and **III** are correct
2. Only **I**, **III** and **IV** are correct
3. Only **II**, **III** and **IV** are correct
4. **I**, **II**, **III** and **IV** are correct

42 Pleurobrachia and ctenoplana belong to:
1. Porifera
2. Cnidaria
3. Ctenophora
4. Platyhelminthes

PHYLUM PLATYHELMINTHES

43 Triploblastic organization, bilateral symmetry but lack of coelom will be seen in:

1.	*Planaria*	2.	*Pheretima*
3.	*Periplaneta*	4.	*Pinctada*

44 A worm:

I:	has dorso-ventrally flattened body
II:	is an endoparasite in human beings
III:	has hooks and suckers present at its anterior end

In light of the above statements, it will be reasonable to conclude that this worm belongs to Phlyum:

1.	Platyhelminthes	2.	Annelida
3.	Aschelminthes	4.	Cnidaria

45 Consider the two statements:

Statement I:	*Planaria* is a free-living flatworm and possesses high regeneration capacity.
Statement II:	Hooks and suckers are present in parasitic flatworms.

1. **Statement I** is correct and **Statement II** is incorrect
2. **Statement I** is incorrect and **Statement II** is correct
3. Both **Statement I** and **Statement II** are correct
4. Both **Statement I** and **Statement II** are incorrect

46 For osmoregulation and excretion, flatworms use:

1.	statocysts	2.	osphradia
3.	flame cells	4.	antennal glands

47 Consider the given two statements:

Assertion (A):	Flatworms have a dorso-ventrally flattened body.
Reason (R):	They are mostly endoparasites.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
3.	**(A)** is True; **(R)** is False
4.	Both **(A)** and **(R)** are False

48 *Planaria*, an organism that possesses high regeneration capacity, belongs to:
1. Porifera
2. Cnidaria
3. Platyhelminthes
4. Echinodermata

49 The correct statements regarding Platyhelminthes will be:

a. All living members of the phylum are parasites.
b. They lack a true coelom but have a pseudo coelom.
c. Body is dorso-ventrally flattened.
d. They exhibit bilateral symmetry.

1. Only [a] and [b]
2. Only [b] and [c]
3. Only [a] and [d]
4. Only [c] and [d]

50 *Fasciola* is

1. a nematode
2. liver fluke
3. blood sucking leech
4. a model organism to study genetics

PHYLUM ASCHELMINTHES

51

Assertion (A):	Aschelminthes are called round worms.
Reason (R):	The body of the aschelminthes is circular in cross-section.

1. **(A)** is True but **(R)** is False.
2. Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
3. Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
4. **(A)** is False but **(R)** is True.

52 Consider the given two statements:

Assertion (A):	Roundworms are considered pseudocoelomates.
Reason (R):	They have a body cavity not lined with mesoderm.

1. Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2. Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3. **(A)** is True but **(R)** is False.
4. Both **(A)** and **(R)** are False.

53 Consider the following statements regarding roundworms:

Statement I:	Alimentary canal is complete with a well-developed muscular pharynx.
Statement II:	An excretory tube removes body wastes from the body cavity through the excretory pore.
Statement III:	They are dioecious and males are longer than females.

The incorrect statement is/are:

1. Only **Statement II**
2. Only **Statement III**
3. Only **Statement I** and **Statement II**
4. Only **Statement II** and **Statement III**

54 Body cavity is the cavity present between body wall and gut wall. In some animals, the body cavity is not lined by mesoderm. Such animals are called

1.	Acoelomate	2.	Pseudocoelomate
3.	Coelomate	4.	Haemocoelomate

55 *Ascaris* is characterized by:

1. Presence of true coelom but absence of metamerism
2. Presence of true coelom and metamerism
3. Absence of true coelom but presence of metamerism
4. Presence of neither true coelom nor metamerism

56 In roundworms:

Statement I:	Males are diploblastic; females are triploblastic
Statement II:	Generally, males are longer than females

1. **Statement I** is correct and **Statement II** is incorrect
2. **Statement I** is incorrect and **Statement II** is correct
3. Both **Statement I** and **Statement II** are correct
4. Both **Statement I** and **Statement II** are incorrect

57 Match the following:

	Column I		**Column II**
A.	*Ascaris*	P.	Filaria worm
B.	*Wuchereria*	Q.	Roundworm
C.	*Ancylostoma*	R.	Hookworm

Codes

	A	B	C
1.	R	Q	P
2.	R	P	Q
3.	Q	R	P
4.	Q	P	R

PHYLUM ANNELIDA

58 How many of the given statements regarding Annelids are true?

I:	They exhibit organ-system level of body organisation and bilateral symmetry.
II:	They are triploblastic, metamerically segmented and coelomate animals.
III:	They possess only longitudinal muscles in their body wall which help in locomotion.
IV:	A closed circulatory system is present.

1. 1
2. 2
3. 3
4. 4

59 A primary characteristic feature of annelids will be:

1. Exoskeleton
2. Jointed appendages
3. Metameric Segmentation
4. Radula

60 No annelid is :

I: Parasitic
II: Diploblastic

1. Only I
2. Only II
3. Both I and II
4. Neither I nor II

61 Identify the incorrect statement regarding animals belonging to Phylum Annelida:

1.	Aquatic annelids like *Nereis* possess lateral appendages, parapodia, which help in swimming.
2.	*Nereis* is dioecious.
3.	Earthworm is monoecious.
4.	*Hirudinaria*, blood-sucking leech, is an annelid that lacks true coelom and metamerism.

62 The ragworm, *Nereis*, is a/an:

1.	Flatworm	2.	Roundworm
3.	Annelid	4.	Mollusc

63 Parapodia are found in:

1. aquatic molluscs, and help in respiration.
2. benthic echinoderms, and help in gathering food.
3. Ctenophores, and help in locomotion.
4. aquatic annelids, and help in swimming.

64 Neural system consists of paired ganglia connected by lateral nerves to a double ventral nerve cord in:

1. *Hydra*
2. Cephalochordates
3. Amphibians
4. Annelids

65 Which of the following is not an annelid?

1. *Nereis*
2. *Pheretima*
3. *Hirudinaria*
4. *Ancylostoma*

PHYLUM ARTHROPODA

66 The most successful [largest phylum] in the animal kingdom is:

1.	Phylum Arthropoda	2.	Phylum Chordata
3.	Phylum Mollusca	4.	Phylum Porifera

67 Over two-thirds of all named species on earth are:

1. Molluscs
2. Arthropods
3. Chordates
4. Sponges

68 Which of the following statements is incorrect about the phylum Arthropoda?

1.	Arthropods have an open circulatory system.
2.	Arthropods exhibit bilateral symmetry.
3.	All arthropods possess jointed appendages.
4.	Arthropods possess a segmented body plan with a pseudocoelom.

69 Insects belong to the phylum Arthropoda. Their exoskeleton is primarily composed of:

1. Calcium carbonate
2. Chitin
3. Silica
4. Keratin

70 Identify the correct statements regarding arthropods:

I:	They are bilaterally symmetrical, triploblastic, non-segmented and pseudocoelomate animals.
II:	Arthropoda is the largest phylum of Animalia and includes more than 90 % of all species on the earth that are named so far.
III:	Insects are arthropods with body consisting of head, thorax and abdomen.

1.	Only **I**	2.	Only **I** and **II**
3.	Only **III**	4.	Only **II** and **III**

71 How many of the given statements regarding arthropods in general are true?

I:	Body of arthropods is covered by chitinous exoskeleton.
II:	They have jointed appendages (arthros-joint, poda-appendages).
III:	Circulatory system is of open type.
IV:	Excretion takes place through malpighian tubules in insects.
V:	They are mostly dioecious and fertilisation is usually internal.
VI:	They are mostly oviparous.

1. 4
2. 5
3. 6
4. 7

72 Which of the following is not an Arthropod characteristic?

1.	Jointed appendages	2.	Periodic molting
3.	Closed circulation	4.	Articulated exoskeleton

73 Statocysts, present in some animals, help directly in:

1. Locomotion
2. Respiration
3. Feeding
4. Balancing

74 Which of the following are not used in respiration in arthropoda?

1. Gills
2. Book lungs
3. Tracheal system
4. Malpighian tubules

75 Match each item in Column I with one in Column II and select the correct match from the codes given:

	Column I		**Column II**
A.	Insect reared for producing silk	P.	*Locusta*
B.	Mosquito acting as vector for Dengue virus	Q.	*Bombyx*
C.	Gregarious pest	R.	*Limulus*
D.	Living fossil	S.	*Aedes*

Codes:

	A	B	C	D
1.	Q	S	P	R
2.	Q	S	R	P
3.	P	Q	R	S
4.	R	P	Q	S

PHYLUM MOLLUSCA

76 Triploblastic, bilaterally symmetrical animals with true coelom but no segmentation are:

1. Aschelminthes
2. Molluscs
3. Annelids
4. Chordates

77 Identify the incorrect statement regarding Mollusca:

1.	It is the second largest animal Phylum after Phylum Arthropoda.
2.	It includes animals that are bilaterally symmetrical, triploblastic, and coelomate.
3.	Body is covered with a calcareous shell and is metamerically segmented with a distinct head, muscular foot, and visceral hump.
4.	Gills are present in the mantle cavity, a space between the mantle and the hump.

78 How many of the given statements regarding Mollusca are true?

I:	They are bilaterally symmetrical, triploblastic and coelomate animals.
II:	Body is covered by a calcareous shell and is segmented with a distinct head, muscular foot and visceral hump as metameres.
III:	A soft and spongy layer of skin forms a mantle over the visceral hump.
IV:	They are usually dioecious and oviparous with indirect development.

1. 1
2. 2
3. 3
4. 4

79 Radula, a tongue rasping like organ, is characteristically seen in most:

1.	Annelids	2.	Mollusca
3.	Round worms	4.	Arthropods

80 Identify the incorrectly matched pair:

1.	*Pinctada*	Pearl Oyster
2.	*Aplysia*	Sea hare
3.	*Dentalium*	Tusk shell
4.	*Loligo*	Devil fish

81 How many of the animals given in the box belong to Mollusca?

Pila, Echinus, Pinctada, Sepia, Loligo, Cucumaria, Octopus, Limulus, Chaetopleura

1. 4
2. 5
3. 6
4. 7

82 If Arthropoda is the largest phylum of Animalia, which of the following is the second largest phylum of Animalia?

1. Chordata
2. Echinodermata
3. Mollusca
4. Platyhelminthes

83 In a typical mollusc:

I:	Head, muscular foot and visceral hump are body segments.
II:	Mantle over the visceral hump is formed by a layer of skin.
III:	Radula is a file-like rasping organ

1. Only **III** is correct
2. Only **II** and **III** are correct
3. Only **I** and **III** are correct
4. Only **I** and **II** are correct

PHYLUM ECHINODERMATA

84 An important evolutionary transition that appeared for the first time in Echinoderms is:

1.	Bilateral symmetry	2.	Radial symmetry
3.	Tube within a tube plan	4.	Endoskeleton

85 Consider the two statements:

Statement I:	Echinoderms are spiny skinned animals
Statement II:	They have an endoskeleton made of calcareous ossicles

1.	**Statement I** is correct and **Statement II** is incorrect
2.	**Statement I** is incorrect and **Statement II** is correct
3.	Both **Statement I** and **Statement II** are correct
4.	Both **Statement I** and **Statement II** are incorrect

86 Which of the following will be correct regarding Echinoderms?

1.	They have bilateral symmetry as adults and radial symmetry as larvae.
2.	They are triploblastic and coelomates.
3.	They possess a well-developed excretory system.
4.	They have an incomplete digestive system.

87 In Echinoderms:

I:	Digestive system is complete with mouth on the lower (ventral) side and anus on the upper (dorsal) side.
II:	An excretory system is absent.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

88 A water vascular system is characteristically present in:

1.	Annelids	2.	Porifers
3.	Echinoderms	4.	Cartilaginous fishes

89 Consider the given two statements:

Assertion (A):	Echinoderms have a water vascular system.
Reason (R):	The water vascular system is used for locomotion, capturing food, and respiration.

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	Both **(A)** and **(R)** are False.

90 Consider the given two statements:

Assertion (A):	Echinoderms are exclusively marine animals.
Reason (R):	Echinoderms have a water vascular system that functions in locomotion, feeding, and respiration.

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	**(A)** is False but **(R)** is True.

91 How many of the given features will be correct for echinoderms?

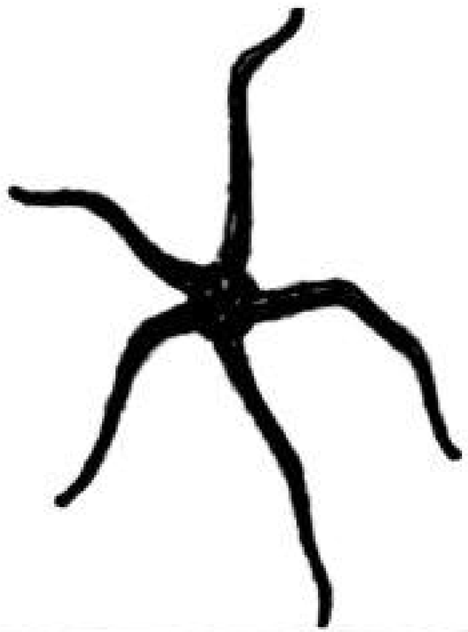
I:	All are marine.
II:	The adults are radially symmetrical.
III:	An excretory system is absent.
IV:	Development is indirect with free-swimming larva.

1. 1
2. 2
3. 3
4. 4

92 Identify the option where all the given animals belong to same phylum:

1.	*Asterias, Echinus, Antedon*, and *Ophiura*
2.	*Balanoglossus, Saccoglossus* and *Amphioxus*
3.	*Pinctada, Aplysia, Dentalium*, and *Obelia*
4.	*Laccifer, Bombyx, Trypanosoma* and *Periplaneta*

93 The organism in the given figure shows pentaradial symmetry [5 body parts]. What else must be present in this organism?



1.	A rasping tongue like organ in alimentary canal
2.	Finger like osmoregulatory and excretory structures at the junction of midgut and hindgut
3.	A water vascular system with tube feet
4.	A large number of cilia used for locomotion

PHYLUM HEMICHORDATA

94 Consider the given two statements:

Assertion (A):	Hemichordata was earlier considered as a sub-phylum under phylum Chordata but now it is placed as a separate phylum under non-chordata.
Reason (R):	Hemichordates have a rudimentary structure in the collar region called stomochord, a structure analogous to notochord.

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	**(A)** is False but **(R)** is True.

95 In which of the following animals, the body is cylindrical and is composed of an anterior proboscis, a collar and a long trunk?

1.	Hemichordates	2.	Urochordates
3.	Cephalochordates	4.	Vertebrate chordates

96 The number of correct statements regarding hemichordates from the given is:

I.	A stomochord is present in the collar region
II.	Circulation is of open type
III.	Excretory organ is proboscis gland
IV.	Development is indirect

1.	1	2.	2
3.	3	4.	4

97 In hemichordates:

1.	Circulatory system is a closed type
2.	Proboscis gland is a digestive gland that secretes a large number of hydrolytic enzymes
3.	Respiration takes place through the gills
4.	Sexes are not separate, fertilization is internal and development is direct

98 Hemichordates are not chordates because they lack a true:

1. gill slit
2. dorsal hollow nerve cord
3. notochord
4. post-anal tail

99 Balanoglossus and saccoglossus are:

1.	Urochordates	2.	Cephalochordates
3.	Hemichordates	4.	Vertebrate chordates

PHYLUM CHORDATA

100 Animals belonging to phylum Chordata are fundamentally characterised by:

I:	the presence of a notochord, a dorsal hollow nerve cord and paired pharyngeal gill slits.
II:	bilateral symmetry, triploblastic body organisation, true coelom with organ-system level of organisation.
III:	a post anal tail and a closed circulatory system.

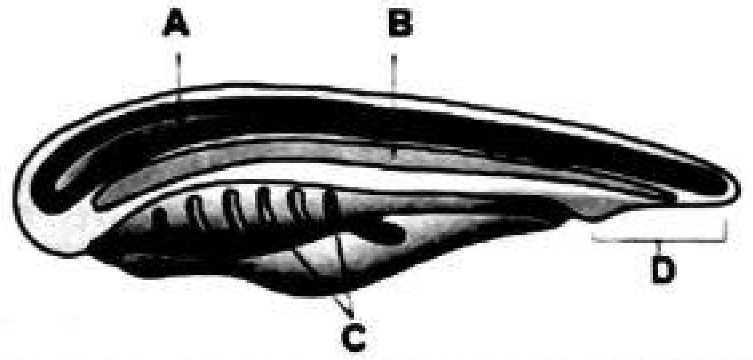
1. Only **I** and **II** are correct
2. Only **I** and **III** are correct
3. Only **II** and **III** are correct
4. **I**, **II** and **III** are correct

101 Which of the following features will be seen in chordates but not in non-chordates?

a.	A notochord
b.	Ventral, solid, and double central nervous system
c.	Pharynx perforated by gill slits
d.	Ventral heart
e.	Terminal anus and a lack of post-anal tail

1.	a, c, and d only	2.	a, b. and e only
3.	a and c only	4.	b, c, and d only

102 Correctly identify the labelled parts of a hypothetical chordate showing the characteristics of chordate in the given figure:



	A	B	C	D
1	Nerve cord	Notochord	Gill slits	Terminal anus
2	Notochord	Nerve cord	Gill slits	Post anal tail
3	Nerve cord	Notochord	Gill slits	Post anal tail
4	Notochord	Nerve cord	Muscle myotome	Terminal anus

103 Consider the given statements:

Statement I:	In Urochordata, notochord is present only in larval tail.
Statement II:	In Cephalochordata, notochord extends from head to tail region and is persistent throughout their life.
Statement III:	Both Urochordates and Cephalochordates are exclusively marine.

Which of the given statements is/ are true?

1. Only **Statement I** and **Statement II**
2. Only **Statement I** and **Statement III**
3. Only **Statement II** and **Statement III**
4. **Statement I, Statement II**, and **Statement III**

104 Consider the given two statements:

Statement I:	Protochordates are exclusively marine.
Statement II:	In Urochordata, notochord is present only in larval tail, while in Cephalochordata, it extends from head to tail region and is persistent throughout their life.

1. **Statement I** is correct; **Statement II** is correct
2. **Statement I** is correct; **Statement II** is incorrect
3. **Statement I** is incorrect; **Statement II** is correct
4. **Statement I** is incorrect; **Statement II** is incorrect

105 All the following animals are Urochordates except:

1. *Ascidia*
2. *Salpa*
3. *Doliolum*
4. *Branchiostoma*

106 Tunicates are included in which sub-phylum of Chordata?

1.	Urochordata	2.	Cephalochordata
3.	Cyclostomata	4.	Hemichordata

107 Match each item in Column I with one in Column II and select the correct match from the codes given:

	Column I		**Column II**
A.	*Petromyzon and Myxine*	P.	Cyclostome
B.	Amphioxus or Lancelet	Q.	Cephalochordate
C.	*Ascidia and Salpa*	R.	Urochordate

Codes:

	A	B	C
1.	P	Q	R
2.	R	Q	P
3.	P	R	Q
4.	R	P	Q

108 Consider the given two statements:

Assertion(A):	All chordates are not vertebrates.
Reason (R):	All chordates do not have a notochord at any stage of their development.

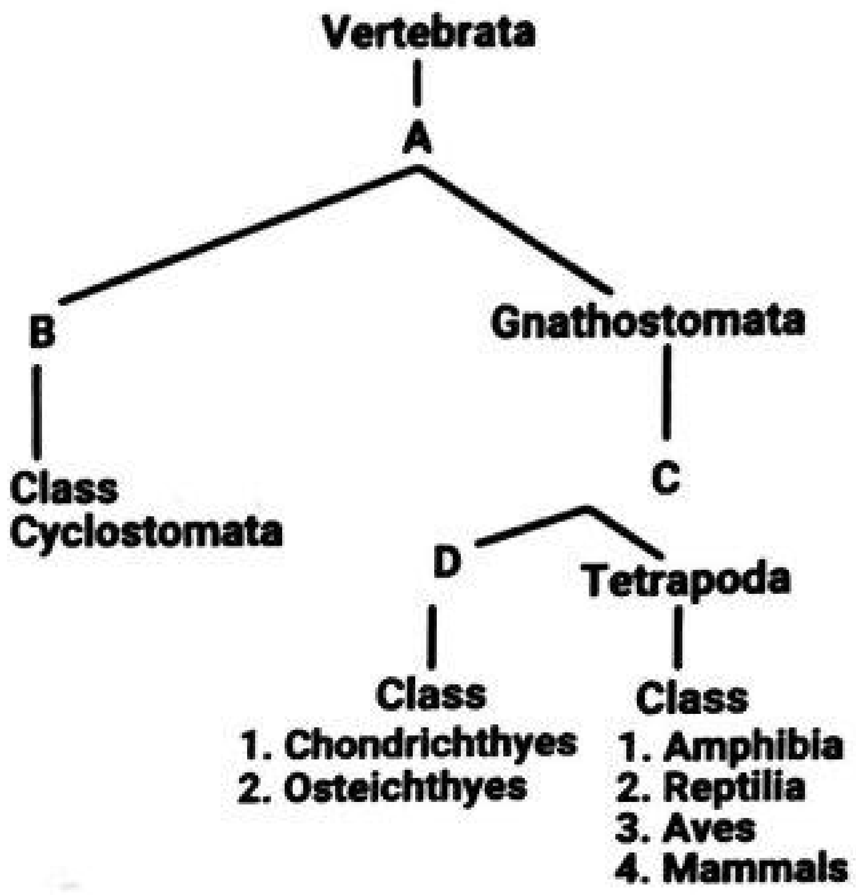
1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**
2.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
3.	**(A)** is True; **(R)** is False
4.	Both **(A)** and **(R)** are False

109 Consider the two statements:

Statement I:	All vertebrates are chordates but all chordates are not vertebrates.
Statement II:	Besides the basic chordate features, all vertebrates have at least a three-chambered heart and paired appendages.

1.	Both **Statement I** and **Statement II** are correct but **Statement II** does not explain **Statement I.**
2.	**Statement I** is correct and **Statement II** is incorrect.
3.	Both **Statement I** and **Statement II** are incorrect.
4.	Both **Statement I** and **Statement II** are correct and **Statement II** explains **Statement I**.

110 The given flow chart shows the classification scheme of sub-phylum Vertebrata. Identify A, B, C and D.



	A	B	C	D
1.	Phylum	Cephalochordata	Urochordata	Protochordata
2.	Division	Agnatha	Super-Class	Pisces
3.	Phylum	Protochordata	Infra-class	Jawless fishes
4.	Division	Agnatha	Sub-division	Pisces

111 Identify the correct statement regarding classification of chordates:

1.	Vertebrata is a subphylum; Agnatha is a division and Pisces is a super-class
2.	Vertebrata is a supraphylum; Agnatha is a phylum and Pisces is a super-class
3.	Vertebrata is a subphylum; Agnatha is a division and Pisces is a class
4.	Vertebrata is a subphylum; Agnatha is a super-class and Pisces is a class

CLASS CYCLOSTOMATA

112 The number of correct statements from the given statements, regarding the members of Class Cyclostomata, is:

a. All living members are ectoparasites on some fishes.
b. The body bears 6-15 pairs of gill slits for respiration.
c. They have a sucking and circular mouth without jaws.
d. Their body is devoid of scales and paired fins.
e. Cranium and vertebral column are bony.
f. Circulation is of open type.

1.	3	2.	4
3.	5	4.	6

113 Regarding reproduction in Cyclostomes:

I:	They are marine but migrate for spawning to fresh water.
II:	After spawning, within a few days, they die.
III:	Their larvae, after metamorphosis, return to the ocean.

1. Only **II** is correct
2. Only **I** and **II** are correct
3. Only **II** and **III** are correct
4. **I**, **II** and **III** are correct

114 Identify the pair of animals that are members of Class Cyclostomata:

1.	*Petromyzon, Myxine*
2.	*Ascidia, Salpa*
3.	*Pristis, Doliolum*
4.	*Branchiostoma, Balanoglossus*

115

Assertion (A):	Cyclostomes are chordates but not vertebrates.
Reason (R):	Cyclostomes lack a vertebral column but have a notochord.

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	**(A)** is False and **(R)** is False.

116 In *Petromyzon* (Lamprey):

I:	gill slits are used for respiration.
II:	circulation is of closed type.
III:	sucking and circular mouth with strong jaw is present.

1. Only **I** and **II** are correct
2. Only **I** and **III** are correct
3. Only **II** and **III** are correct
4. **I**, **II** and **III** are correct

CLASS CHONDRICHTHYES

117 Chondrichthyes:

1.	are marine animals and have cartilaginous endoskeleton
2.	have a mouth located dorsally
3.	have teeth that are modified cycloid or ctenoid scales directed backwardly
4.	have the capacity to regulate their body temperature

118 What would not be true regarding cartilaginous fishes?

1.	In males, pelvic fins bear claspers
2.	Some of them have electric organs [*Torpedo*]
3.	None of them is viviparous
4.	Some possess poison sting [*Trygon*]

119 In chondrichthyes:

1.	Mouth is ventral, teeth are modified ctenoid scales and directed forwards.
2.	Mouth is ventral, teeth are modified placoid scales and directed backwards.
3.	Mouth is dorsal, teeth are modified ctenoid scales and directed forwards.
4.	Mouth is dorsal, teeth are modified placoid scales and directed backwards.

120 Consider the given two statements:

Assertion (A):	Cartilaginous fishes have to swim continuously to avoid sinking
Reason (R):	Cartilaginous fishes lack a swim bladder

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	**(A)** is False but **(R)** is False.

121 How many of the given pairs are correctly matched?

I. Scoliodon - Dog fish
II. Pristis- Saw Fish
III. Trygon - Sting ray
IV. Carcharodon- Blue whale

1. 1
2. 2
3. 3
4. 4

122 Consider the two statements:

Statement I:	Cartilaginous fishes have internal fertilization
Statement II:	Many cartilaginous fishes have viviparity

1.	**Statement I** is correct and **Statement II** is incorrect
2.	**Statement I** is incorrect and **Statement II** is correct
3.	Both **Statement I** and **Statement II** are correct
4.	Both **Statement I** and **Statement II** are incorrect

CLASS OSTEICHTHYES

123 Mouth in bony fishes is mostly:

1. lacking jaws
2. ventral
3. terminal
4. having a radula

124 Identify the incorrect statement regarding bony fishes:

I:	They have four pairs of gills which are covered by an operculum on each side.
II:	Due to the absence of air bladder, they have to swim constantly to avoid sinking.
III:	Skin is covered with placoid scales.
IV:	Mouth is mostly terminal.

1.	Only **II**	2.	Only **II** and **III**
3.	Only **I** and **IV**	4.	Only **IV**

125 The characteristics of osteichthyes include:

I:	Four pairs of gills covered by an operculum on each side
II:	Skin covered with placoid scales
III:	Regulation of buoyancy by an air bladder

1. Only **I** and **II**
2. Only **II** and **III**
3. Only **I** and **III**
4. **I**, **II** and **III**

126 Consider the given two statements:

Assertion (A):	The swim bladder is an essential organ for bony fishes.
Reason (R):	It allows them to maintain buoyancy without expending energy.

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	**(A)** is False but **(R)** is True.

127 Which of the following will not be true for bony fishes?

1. Heart is two chambered
2. Cold blooded animals
3. Sexes separate but fertilization is usually internal
4. Mostly oviparous

128 Hippocampus [sea horse] is a:

1. marine bony fish
2. fresh water bony fish
3. cartilaginous fish
4. limbless amphibian

129 Which of the following is not a bony fish?

1. Angel fish	2. Flying fish
3. Star fish	4. Fighting fish

130 *Exocoetus, Labeo, Clarias* and *Pterophyllum* are all:

1. endotherms	2. marine fishes
3. protochordates	4. bony fishes

131 How many pairs are correctly matched?

I: Exocoetus-Flying fish
II: Betta-Fighting fish
III: Pterophyllum : Angel fish

1. 0
2. 1
2. 2
4. 3

CLASS AMPHIBIA

132 Which of the following is not a characteristic of Amphibians?

1.	Most have two pairs of limbs and tail is present in some.
2.	Alimentary canal, urinary and reproductive tracts open into a common chamber called cloaca which opens to the exterior.
3.	Respiration is by gills, lungs and through skin.
4.	The heart is two chambered with one atrium and one ventricle.

133 In Amphibia:

I:	Skin is moist without scales
II:	A tympanum represents the ear
III:	Fertilization is external

1.	Only **I** and **II** are correct	2.	Only **I** and **III** are correct
3.	Only **II** and **III** are correct	4.	**I, II**, and **III** are correct

134 In amphibians cloaca is the common chamber and outlet into which open the:

I: gastrointestinal tract
II: urinary tract
III: genital tract

1. Only **I** and **II** are correct
2. Only **I** and **III** are correct
3. Only **II** and **III** are correct
4. **I, II** and **III** are correct

135 Consider the given two statements:

Assertion(A):	It is important that amphibian skin is without scales and is kept moist.
Reason (R):	Amphibians respire through skin.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A).**
3.	**(A)** is True; **(R)** is False
4.	Both **(A)** and **(R)** are False

136 How many statements regarding amphibians are correct?

I:	The eyes have eyelids.
II:	A tympanum represents the ear.
III:	Alimentary canal, urinary and reproductive tracts open into a common chamber called cloaca which opens to the exterior.
IV:	The heart is three-chambered.
V:	These are cold-blooded animals.

1. 2
2. 3
3. 4
4. 5

137 All the following are correct for amphibians except:

1. Skin is moist and without scales.
2. A tympanum represents the ear.
3. Eyes lack eyelids.
4. Heart is three chambered.

138 In amphibians:

I:	Alimentary canal and reproductive tracts open into a common chamber called cloaca which opens to the exterior but the urinary system has a separate opening to the exterior.
II:	Respiration is by gills, lungs and through skin.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

139 Which statement accurately describes a feature of amphibians?

1.	Amphibians are exclusively terrestrial and breathe through lungs.
2.	Amphibians undergo metamorphosis from a larval stage to an adult form.
3.	Amphibians have scales and typically lay amniotic eggs.
4.	All amphibians have a four-chambered heart.

140 *Icthyophis* is a/an:

1. Tunicate chordate	2. Flightless bird
3. Limbless amphibian	4. Egg-laying mammal

CLASS REPTILIA

141 Most reptiles:

I. are terrestrial
II. have a three-chambered heart

1. Only I is correct	2. Only II is correct
3. Both I and II are correct	4. Both I and II are incorrect

142 In reptiles:

I:	Body is covered by dry and cornified skin, dermal scales or scutes.
II:	External ear is not present and tympanum represents the ear.
III:	Scales are shed as skin cast in all members.
IV:	Fertilization is internal and development is direct.

1.	Only **II** is correct	2.	Only **II** and **IV** are correct
3.	All are correct	4.	Only **I** and **II** are incorrect

143 Which of the following reptiles has a four chambered heart?

1.	Crocodile	2.	Wall lizard
3.	Turtle	4.	Tortoise

144 Which of the following animals has three chambered heart?

1.	*Scoliodon*	2.	*Hippocampus*
3.	*Chelone*	4.	*Pteropus*

145 Identify the incorrect statement regarding reptiles:

1.	They are mostly aquatic animals and their body is covered by dry and cornified skin, dermal scales or scutes.
2.	They do not have external ear openings. Tympanum represents ear.
3.	Heart is usually three-chambered, but four-chambered in crocodiles.
4.	They are oviparous and development is direct.

146 Which of the following feature of reptiles sets them apart from amphibians?

1. Three-chambered heart
2. Epidermal Scales or scutes
3. Gills
4. Metamorphosis

147 A non-glandular skin will be seen in both:

1. Snake and Frog
2. Chameleon and Turtle
3. Frog and Pigeon
4. Crocodile and Tiger

148 Which one of the following is not a poisonous snake?

1.	Cobra	2.	Viper
3.	Python	4.	Krait

CLASS AVES

149 In birds:

a:	the characteristic feature is the presence of feathers.
b:	forelimbs are modified into wings.
c:	flight is present in all members.
d:	hind limbs do not have scales.

1. Only **(a)** and **(d)** are incorrect
2. Only **(c)** and **(d)** are correct
3. **(a)**, **(b)** and **(c)** are correct
4. Only **(a)** and **(b)** are correct

150 Birds are not characterized by:

1. a fully ossified endoskeleton
2. pneumatic long bones
3. absence of crop and gizzard in the digestive tract
4. a dry skin without glands except the oil gland

151 Consider the given two statements:

I:	Birds have a four chambered heart and are warm blooded.
II:	Respiration in birds is by lungs that are connected to air sacs.

1. **I** is correct but **II** is incorrect
2. Both **I** and **II** are correct.
3. Both **I** and **II** are incorrect.
4. **I** is incorrect but **II** is correct.

152 In birds:

I:	The digestive tract of birds has additional chambers, the crop and gizzard.
II:	Air sacs connected to lungs supplement respiration.
III:	They possess beak with teeth.

1.	Only **I** and **II** are correct	2.	Only **I** and **III** are correct
3.	Only **II** and **III** are correct	4.	**I**, **II** and **III** are correct

153 You find the skeletal remains of an animal which show the following features:
I: It is fully ossified [bony]
II: Long bones are hollow
The organism most likely is a:

1. Mammal
2. Reptile
3. Bird
4. Amphibian

154 How many of the given statements regarding birds are correct?

I:	They have feathers and most of them can fly.
II:	They possess beak.
III:	They have scales on the forelimbs and hindlimbs are modified into wings.
IV:	They have dry skin without glands except the oil gland at the base of the tail.
V:	They possess a fully ossified (bony) endoskeleton.
VI:	They have long bones that are solid without air cavities (pneumatic).

1.	3	2.	4
3.	5	4.	6

155 Identify the incorrectly matched pair:

	Biological name	**Common name**
1.	*Aptenodytes*	Penguin
2.	*Pavo*	Peacock
3.	*Struthio*	Pigeon
4.	*Psittacula*	Parrot

CLASS MAMMALIA

156 The most unique characteristic of mammals is the presence of:

1. a four chambered heart	2. a single aortic arch
3. homeothermy	4. mammary glands

157 Regarding mammals:

I:	The most unique characteristic is the presence of mammary glands.
II:	Skin is unique in possessing hair.
III:	Heart is unique in being four-chambered.
IV:	Viviparity is a unique feature.

1. Only **I** and **II** are correct
2. Only **III** and **IV** are correct
3. Only **I** and **III** are correct
4. Only **II** and **IV** are correct

158 Identify the incorrect statements regarding mammals:

I: External ears are absent
II: All teeth are of the same type
III: They are homoiothermous
1. Only **I** and **II**
2. Only **I** and **III**
3. Only **II** and **III**
4. **I**, **II** and **III**

159 Which of the following is an egg laying mammal?

1. *Ornithorhynchus*	2. *Macropus*
3. *Macaca*	4. *Balaenoptera*

160 Flying fox is a/an:

1.	Flightless bird	2.	Limbless amphibian
3.	Viviparous mammal	4.	Economically important insect

ANIMAL KINGDOM - ANSWER KEY

1.	(4)	2.	(1)	3.	(2)	4.	(2)	5.	(3)	6.	(3)	7.	(2)	8.	(3)	9.	(4)	10.	(2)
11.	(4)	12.	(4)	13.	(1)	14.	(4)	15.	(2)	16.	(1)	17.	(4)	18.	(3)	19.	(4)	20.	(2)
21.	(1)	22.	(1)	23.	(1)	24.	(4)	25.	(4)	26.	(1)	27.	(2)	28.	(1)	29.	(3)	30.	(4)
31.	(1)	32.	(1)	33.	(3)	34.	(2)	35.	(1)	36.	(4)	37.	(2)	38.	(3)	39.	(4)	40.	(2)
41.	(4)	42.	(3)	43.	(1)	44.	(1)	45.	(3)	46.	(3)	47.	(2)	48.	(3)	49.	(4)	50.	(2)
51.	(2)	52.	(1)	53.	(2)	54.	(2)	55.	(4)	56.	(4)	57.	(4)	58.	(3)	59.	(3)	60.	(2)
61.	(4)	62.	(3)	63.	(4)	64.	(4)	65.	(4)	66.	(1)	67.	(2)	68.	(4)	69.	(2)	70.	(3)
71.	(3)	72.	(3)	73.	(4)	74.	(4)	75.	(1)	76.	(2)	77.	(3)	78.	(3)	79.	(2)	80.	(4)
81.	(3)	82.	(3)	83.	(2)	84.	(4)	85.	(3)	86.	(2)	87.	(3)	88.	(3)	89.	(1)	90.	(2)
91.	(4)	92.	(1)	93.	(3)	94.	(1)	95.	(1)	96.	(4)	97.	(3)	98.	(3)	99.	(3)	100.	(4)
101.	(1)	102.	(3)	103.	(4)	104.	(1)	105.	(4)	106.	(1)	107.	(1)	108.	(3)	109.	(2)	110.	(2)
111.	(1)	112.	(2)	113.	(4)	114.	(1)	115.	(4)	116.	(1)	117.	(1)	118.	(3)	119.	(2)	120.	(1)
121.	(3)	122.	(3)	123.	(3)	124.	(2)	125.	(3)	126.	(1)	127.	(3)	128.	(1)	129.	(3)	130.	(4)
131.	(4)	132.	(4)	133.	(4)	134.	(4)	135.	(1)	136.	(4)	137.	(3)	138.	(2)	139.	(2)	140.	(3)
141.	(3)	142.	(2)	143.	(1)	144.	(3)	145.	(1)	146.	(2)	147.	(2)	148.	(3)	149.	(4)	150.	(3)
151.	(2)	152.	(1)	153.	(3)	154.	(2)	155.	(3)	156.	(4)	157.	(1)	158.	(1)	159.	(1)	160.	(3)

ORGAN AND ORGAN SYSTEM

1 The biological level of organization arranges living things from the simplest to the most complex where the tissue level of organisation lies between:

1.	Organelle and Organ system levels
2.	Cell and Organ levels
3.	Organ and Organ system levels
4.	Organ system and Organism levels

2 Consider the two statements:

Statement I:	Morphology refers to the form and structure of animals and plants, studied as a science.
Statement II:	Anatomy is concerned with the identification and description of the body structures of living things.

1. **Statement I** and **Statement II** are incorrect
2. **Statement I** is correct and **Statement II** is incorrect
3. **Statement I** and **Statement II** are correct
4. **Statement I** is incorrect and **Statement II** is correct

ANIMAL TISSUES

3 In Biology 'tissue' is a level of organization between:
1. cell and organ
2. molecules and cell
3. cells and organ system
4. organ and organ system

4 Which of the following is not a tissue seen in Animals?
1. Epidermis
2. Epithelium
3. Connective
4. Neural

5 The type of epithelium normally found at the 'diffusion boundary' in human body is:
1. Simple squamous
2. Simple cuboidal
3. Simple columnar
4. Ciliated columnar

6 Which one of the following types of cell is involved in making of the inner walls of large blood vessels?
1. Cuboidal epithelium
2. Columnar epithelium
3. Squamous epithelium
4. Stratified epithelium

7 Identify the incorrectly matched pair:

	Type of epithelium	Location
1.	Simple squamous	Blood vessels and alveoli
2.	Simple cuboidal non brush bordered epithelium	Proximal convoluted tubule
3.	Columnar epithelium	Stomach and small intestine
4.	Ciliated epithelium	Bronchioles and fallopian tubes

8 Simple squamous epithelium is not found at which of the following locations in human body?

1.	walls of blood vessels	2.	alveoli sac
3.	distal convoluted tubule	4.	loop of Henle

9 Match the type of epithelium to their correct location:

1.	Columnar epithelium - Alveoli of lungs
2.	Squamous epithelium - Lining of the intestine
3.	Cuboidal epithelium - Kidney tubules
4.	Ciliated epithelium - Ovarian surface

10 Ciliated epithelium is expected to be found in:

I:	Respiratory passage
II:	Oviducts

1.	Only **I**	2.	Only **II**
3.	Both **I** and **II**	4.	Neither **I** nor **II**

11 Brush bordered epithelium is expected to be found in:

I:	PCT of nephron
II:	Lining of small intestine

1. Only **I**
2. Only **II**
3. Both **I** and **II**
4. Neither **I** nor **II**

12 Epithelial tissues lining the inner surface of the stomach are simple columnar epithelium with microvilli. What is the primary function of these microvilli?

1.	They provide structural support
2.	They facilitate secretion
3.	They increase surface area for absorption
4.	They act as sensory receptors

13 Unicellular glands located in the alimentary canal are called as:

1.	Paneth cells	2.	Peyer's patches
3.	Goblet cells	4.	Histiocytes

14 What is the best description of an endocrine gland?

1.	They secrete mucus, saliva, ear wax and digestive enzymes
2.	Their products are released through ducts or tubes
3.	Unlike exocrine glands, they are not modified epithelium
4.	Their secretions are secreted directly into the fluid bathing the gland

15 Consider the given two statements:

Assertion (A):	Compound epithelium has a limited role in secretion and absorption.
Reason (R):	Compound epithelium is made of more than one layer (multi-layered) of cells.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
3.	**(A)** is True; **(R)** is False
4.	Both **(A)** and **(R)** are False

16 Compound epithelium is found at all the following locations except:

1.	dry surface of the skin
2.	moist surface of buccal cavity
3.	inner lining of ducts of salivary glands and pancreatic ducts
4.	lining of stomach and small intestine

17 What type of epithelial cell junctions facilitate the cells to communicate with each other?

1. Gap junctions
2. Adhering junctions
3. Tight junctions
4. Plasmodesmata

18 The cell junctions in animal tissues that perform the function of cementing to keep neighbouring cells together are known as:

1. Tight junctions
2. Adhering junctions
3. Gap junctions
4. Desmosomes

19 Match the following cell junctions with their descriptions:

	Column I		**Column II**
A.	Tight junctions	i.	Allow passage of ions and small molecules between cells
B.	Desmosomes	ii.	Prevent the passage of molecules between cells
C.	Gap junctions	iii.	Provide mechanical strength

1. A-ii, B-iii, C-i
2. A-i, B-ii, C-iii
3. A-iii, B-i, C-ii
4. A-ii, B-i, C-iii

20

Assertion(A):	Simple squamous epithelium lines the diffusion membranes in human body.
Reason(R):	Simple squamous epithelium is dorso-ventrally flattened and very thin.

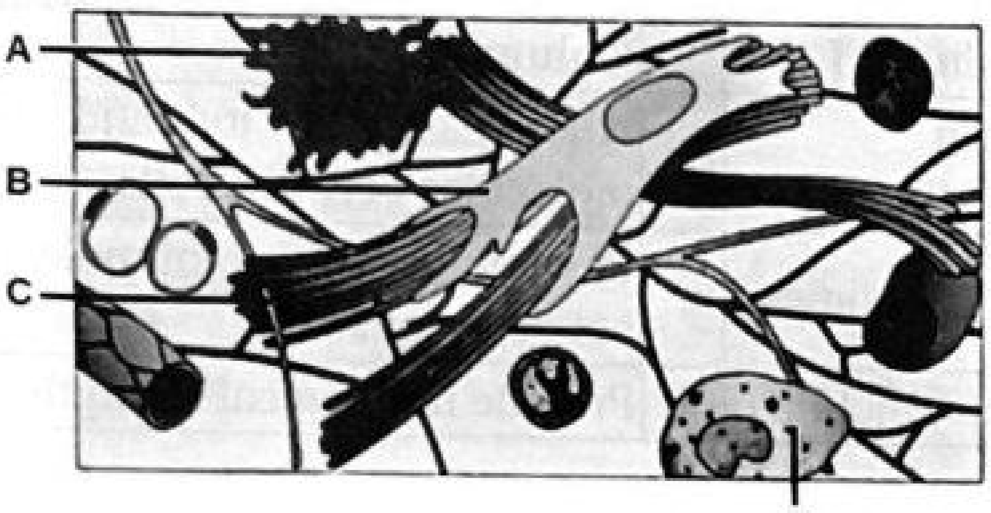
1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	**(A)** is False and **(R)** is True.

21 Identify the correct statements regarding connective tissue?

I:	Collagen and Elastin fibres are secreted by cells of all connective tissues
II:	Matrix (ground substance) is predominantly polysaccharides
III:	Connective tissues link or support other tissues/ organs of the body

1. Only **I** and **II**
2. Only **I** and **III**
3. Only **II** and **III**
4. **I, II** and **III**

22 What are the structures labelled A, B, C and D respectively, in the given diagram?



1.	Mast cell, Fibroblast, Collagen, Macrophage
2.	Mast cell, Dendritic cell, Collagen, Macrophage
3.	Macrophage, Fibroblast, Elastin, Mast cell
4.	Macrophage, Fibroblast, Collagen, Mast cell

23 The main cell type responsible for the synthesis and maintenance of the extracellular matrix in connective tissue is:

1.	Fibroblast	2.	Osteocyte
3.	Adipocyte	4.	Chondrocyte

24 Which of the following cells is not likely to be found in a section of areolar tissue?

1.	Macrophage	2.	Fibroblast
3.	Mast cell	4.	Chondrocyte

25 The cells in areolar loose connective tissue that can secrete histamine are:

1.	Fibroblasts	2.	Macrophages
3.	Mast cells	4.	Basophils

26 To which one of the following categories does adipose tissue belong?

1.	Epithelial	2.	Connective
3.	Muscular	4.	Neural

27 The main function of adipose tissue is

1.	providing insulation from heat and cold
2.	providing protective padding around organs
3.	to be a reserve of lipids
4.	providing feedback for hunger and diet to the brain

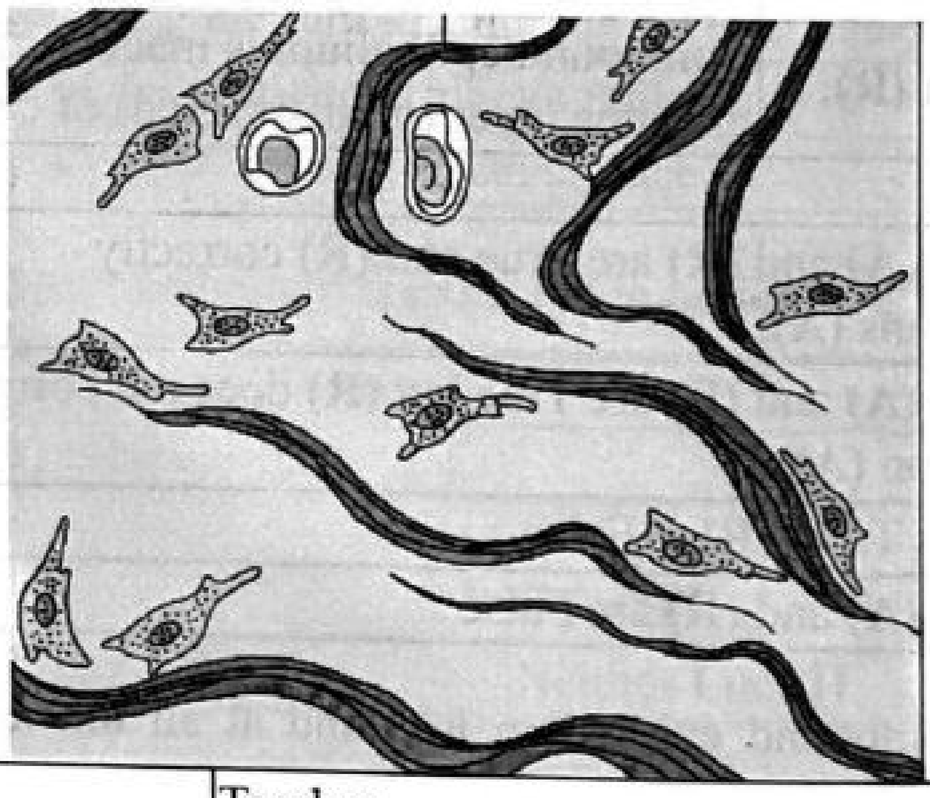
28 Tendons and ligaments are examples of:

1.	Loose connective tissue
2.	Dense irregular connective tissue
3.	Dense regular connective tissue
4.	Specialized connective tissue

29 The type of connective tissue present in skin is:

1.	Loose connective tissue
2.	Dense irregular connective tissue
3.	Dense regular connective tissue
4.	Specialized connective tissue

30 The type of tissue shown in the figure is found in:

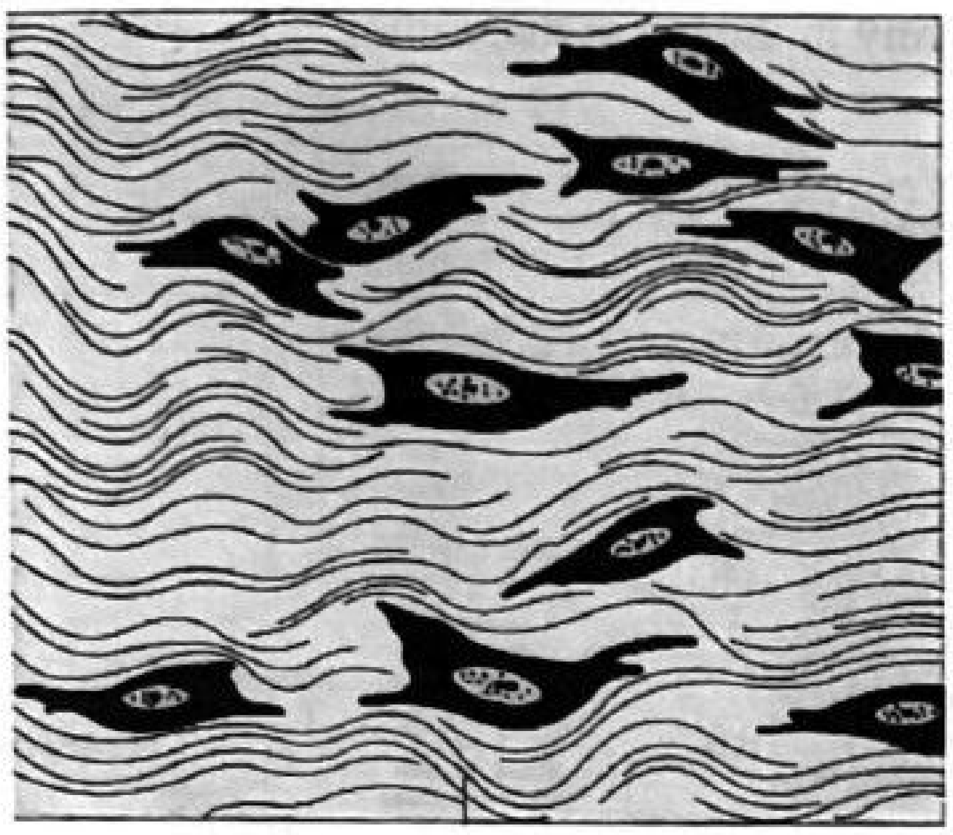


I:	Tendon
II:	Ligament
III:	Skin

1. Only **I** and **II**
2. Only **III**
3. Only **II**
4. **I, II** and **III**

STRUCTURAL ORGANISATION IN ANIMALS

31 The type of tissue shown in the figure is found in:



I: Tendon
II: Ligament
III: Skin

1. Only I and II
2. Only III
3. Only II
4. I, II and III

32 The type of tissue present in the tip of the nose, outer ear joints and between adjacent bones of the vertebral column is a/an:

1.	ligament	2.	dense connective tissue
3.	cartilage	4.	adipose tissue

33 Bone and cartilage are specialised connective tissues where:

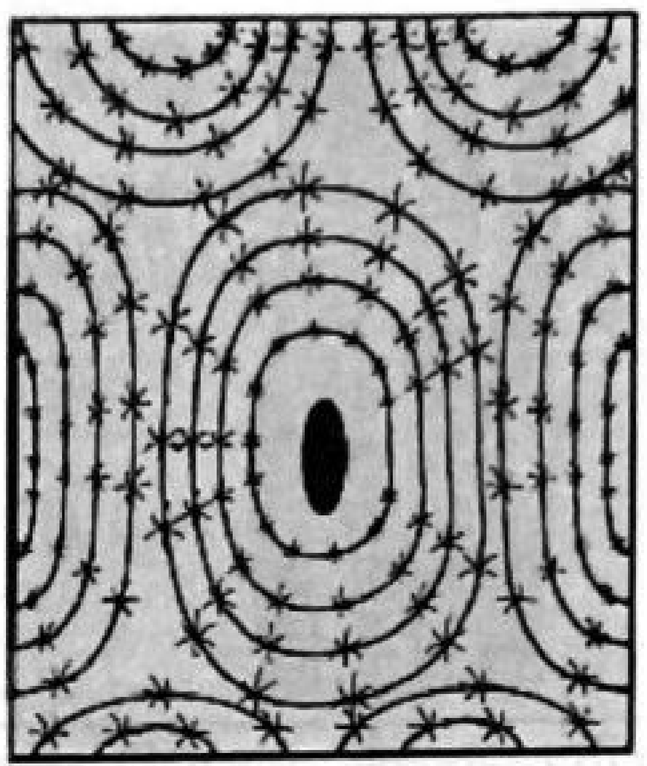
I:	The cartilage has a very hard matrix due to calcium salts in it.
II:	The bone has highly pliable matrix due to chondroitin salts.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

34 Osteocytes [bone cells] are present in spaces called:

1.	Osteon	2.	Lamellae
3.	Haversian canals	4.	Lacunae

35 Regarding the histology shown in the given figure:



I:	It is called as the Osteon
II:	It is the structural unit of a cartilage

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

36 Skeletal muscle fibres:

1.	contract involuntarily
2.	have a striated appearance
3.	are always uninucleate
4.	are present in the walls of internal organs

37 Skeletal muscles are attached to bones by structures called:

1.	Cartilages	2.	Ligaments
3.	Tendons	4.	Fasciae

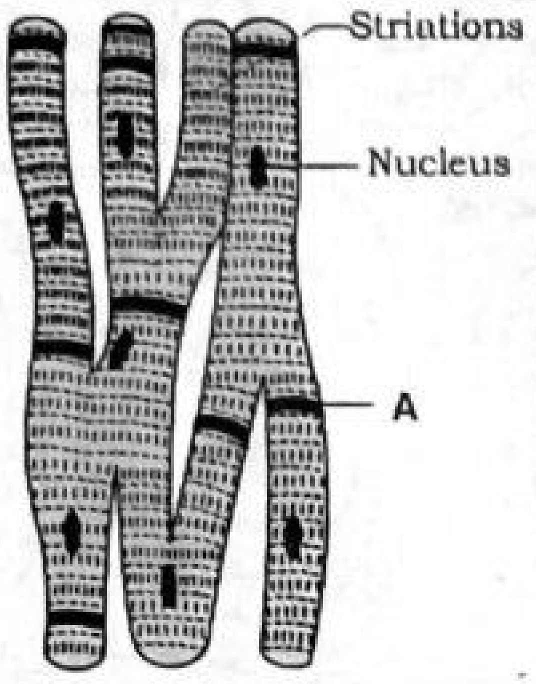
38 Smooth muscles are:

1.	Voluntary and striated
2.	Voluntary and unstriated
3.	Involuntary and unstraited
4.	Involuntary and striated

39 Smooth muscles are found in all the following locations except:

1. Wall of blood vessels
2. Wall of stomach
3. Wall of ureter
4. Wall of abdomen

40 The structure labelled as A in the given figure:


Striations
Nucleus
A

I:	allow the cells to contract as a unit, i.e., when one cell receives a signal to contract, its neighbours are also stimulated to contract.
II:	stop the passage of impulse from one cell to another in the tissue.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

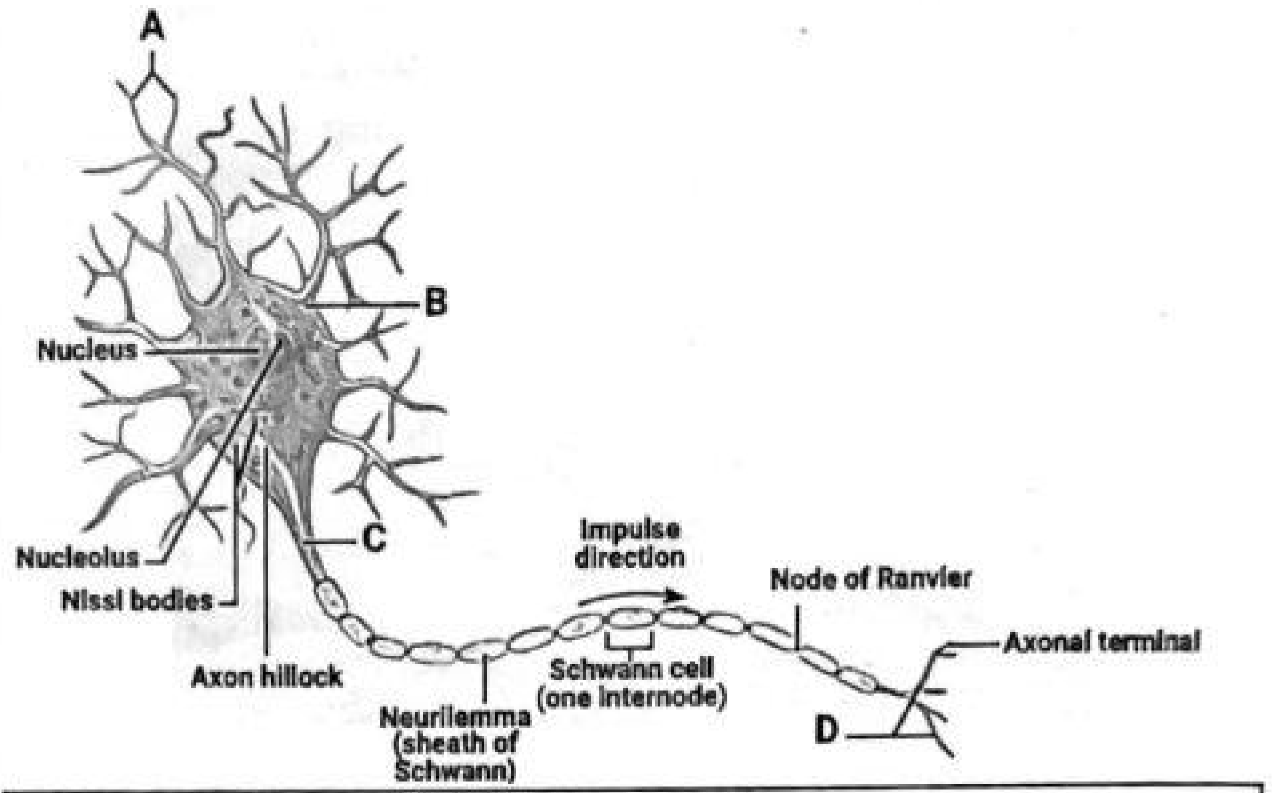
41 Presence of intercalated discs help cardiac muscles to act as a functional syncytium. This is possible because the structure of these discs have:

1.	Tight junctions	2.	Gap junctions
3.	Adhering junctions	4.	Plasmodesmata

42 Apart from the neuron, the neural tissue in the body is also made up of:

1.	Neuroglial cells	2.	Dendritic cells
3.	Myoepithelium	4.	CD4 cells

43 What are the structures labeled A, B, C and D respectively in the given diagram?


A
B
Nucleus
C
Nucleolus
Nissl bodies
Axon hillock
Impulse direction
Node of Ranvier
Axonal terminal
Schwann cell (one internode)
Neurilemma (sheath of Schwann)
D

1.	Dendrites, Soma, Axon, Terminal nerve endings
2.	Dendrites, Soma, Cyton, Terminal nerve endings
3.	Terminal nerve endings, Soma, Axon, Dendrites
4.	Terminal nerve endings, Soma, Perikaryon, Dendrites

44 Consider the given two statements:

Assertion (A):	Cardiac muscle cells can contract as a unit.
Reason (R):	Cardiac muscle tissue is a contractile tissue present only in the heart.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
3.	**(A)** is True; **(R)** is False
4.	Both **(A)** and **(R)** are False

45 Match the following types of tissues with their functions:

	Column I		Column II
1	Adipose tissue	A	Conducts electrical impulses
2	Cartilage	B	Stores fat and provides insulation
3	Smooth muscle tissue	C	Reduces friction between bones at joints
4	Neuron	D	Contracts to cause movement in various organs

1. 1-D, 2-A, 3-B, 4-C
2. 1-C, 2-B, 3-A, 4-D
3. 1-B, 2-C, 3-D, 4-A
4. 1-A, 2-D, 3-C, 4-B

46 Evaluate the following statements and select the option that correctly identifies the true statements:

I:	Collagen fibres are predominantly found in connective tissues and are important for providing tensile strength.
II:	Nervous tissue is made up of neurons and neuroglia, where neurons are responsible for transmitting signals and neuroglia for blood clotting.
III:	Cardiac muscle tissue is striated and involuntary, with cells connected by intercalated discs to facilitate synchronized contraction.
IV:	Epithelial tissues are avascular but derive nutrients through diffusion from underlying connective tissues

1. Only **I**, **III**, and **IV** are correct.
2. Only **I**, **II**, and **III** are correct.
3. Only **II**, **III**, and **IV** are correct.
4. Only **I** and **III** are correct.

FROGS

47 The terms for 'summer sleep' and 'winter sleep' seen in frogs respectively are:

1.	Aestivation and Hibernation
2.	Hibernation and Aestivation
3.	Diapause and Cryptobiosis
4.	Cryptobiosis and Diapause

48 Frog, when on land, uses which of the following as its respiratory organs?

I:	The buccal cavity
II:	Skin
III:	Lungs

1.	**Only I and II**	2.	**Only I and III**
3.	**Only II and III**	4.	**I, II and III**

49 The correct taxonomic position of *Rana tigrina* would be:

I:	Phylum	Chordata
II:	Subphylum	Vertebrata
III:	Superclass	Gnathostomata
IV:	Class	Tetrapoda

1.	**I** and **II** only	2.	**III** and **IV** only
3.	**I** and **III** only	4.	**II** and **IV** only

50 Consider the given two statements:

Assertion (A):	Frogs have the capability to change the colour and resemble their surroundings.
Reason (R):	They are poikilothermous animals.

1.	**(A)** is True but **(R)** is False
2.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**
3.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**
4.	**(A)** is False but **(R)** is True

51 The most common species of frog found in India is:

1.	*Rana temporaria*	2.	*Rana tigrina*
3.	*Bufo bufo*	4.	*Bufo melanostictus*

52 Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R):

Assertion (A):	*Rana tigrina* is cold-blooded or poikilotherm.
Reason (R):	Its body temperature varies with the temperature of the environment.

In the light of the above statements choose the correct answer from the options given below:

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are true but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	Both **(A)** and **(R)** are False.

53 In *Rana tigrina*:

Statement I:	The colour of dorsal side of body is generally olive green with dark irregular spots.
Statement II:	On the ventral side, the skin is uniformly pale yellow.

1.	**Statement I** is correct, **Statement II** is correct
2.	**Statement I** is incorrect, **Statement II** is correct
3.	**Statement I** is correct, **Statement II** is incorrect
4.	**Statement I** is incorrect, **Statement II** is incorrect

54 The frog:

1.	drinks a lot of water and passes a lot of dilute urine.
2.	drinks only some water and meets its requirements from metabolic water.
3.	drinks only some water and passes a highly concentrated urine
4.	never drinks water but absorbs it through the skin.

55 In *Rana tigrina*:

I:	Body is divisible into head and trunk.
II:	A neck and tail are absent.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

56 Which of the following statements regarding morphology of frog is not true?

I:	Above the mouth, a pair of nostrils is present.
II:	Eyes are bulged and covered by a nictitating membrane that protects them while on land.
III:	On either side of eyes, a membranous tympanum (ear) receives sound signals.

1.	Only **II**	2.	Only **II** and **III**
3.	Only **I**	4.	None, all statements are correct

57 In *Rana tigrina*:

a:	The hind limbs end in four digits
b:	The hind limbs are larger and muscular than fore limbs.
c:	The fore limbs end in five digits.
d:	Feet have webbed digits that help in swimming.

1. Only **a** and **b** are correct
2. Only **c** and **d** are correct
3. Only **a** and **c** are correct
4. Only **b** and **d** are correct

58 Frogs exhibit sexual dimorphism. Male frogs can be distinguished from the females by the presence of:

I:	sound producing vocal sacs which are absent in female frogs.
II:	a copulatory pad on the first digit of the hind limbs which is absent in female frogs.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

59 Identify the correct chronological sequence of the appearance of structures in the alimentary canal of frog beginning from the mouth:

1.	Buccal cavity → Pharynx → Oesophagus → Stomach → Intestine → Rectum → Cloaca
2.	Buccal cavity → Oesophagus → Pharynx → Stomach → Intestine → Rectum → Cloaca
3.	Buccal cavity → Pharynx → Oesophagus → Stomach → Intestine → Cloaca → Rectum
4.	Buccal cavity → Oesophagus → Pharynx → Stomach → Intestine → Cloaca → Rectum

60 Liver in frog:

1.	secretes a lot of digestive enzymes.
2.	does not have digestive function.
3.	secretes bile that is stored in the gall bladder.
4.	secretes bile that is not stored as frogs do not have a gall bladder.

61 Regarding feeding in frog:

I:	Frog is a herbivore
II:	Food is captured by the bilobed tongue.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

62 The action of HCl and gastric juices secreted from the walls of the stomach leads to formation of a partially digested food in frog called as:

1.	chyme	2.	chyle
3.	succus entericus	4.	bile

63 Which part of the alimentary canal in frog receives bile from gall bladder and pancreatic juices from the pancreas through a common bile duct?

1.	Stomach	2.	Duodenum
3.	Oesophagus	4.	Pharynx

64 Frogs respire on land and in water by two different methods:

Statement I:	In water, skin acts as aquatic respiratory organ (cutaneous respiration).
Statement II:	On land, the buccal cavity, skin and lungs act as the respiratory organs.

1.	**Statement I** is correct, **Statement II** is correct
2.	**Statement I** is incorrect, **Statement II** is correct
3.	**Statement I** is correct, **Statement II** is incorrect
4.	**Statement I** is incorrect, **Statement II** is incorrect

65 During aestivation and hibernation, gaseous exchange in frogs takes place:
1. across alveoli in the lungs.
2. through the moist buccal mucosa.
3. in gills.
4. through skin.

66 The single ventricle in the heart of a frog:

1.	opens into a sac-like conus arteriosus on the dorsal side of the heart.
2.	opens into a sac-like conus arteriosus on the ventral side of the heart.
3.	opens into a dilated chamber sinus venosus on the ventral side of the heart.
4.	opens into a dilated chamber sinus venosus on the dorsal side of the heart.

67 Unlike humans, frogs have a:

I:	Hepatic portal system
II:	Renal portal system

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

68 Sinus venosus in the heart of a frog:

I:	joins the left atrium
II:	pumps blood into the major arteries

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

69 Consider the two statements:

Statement I:	The vascular system of frog is well-developed and closed type.
Statement II:	Frogs do not have a lymphatic system.

1.	**Statement I** is correct, **Statement II** is correct
2.	**Statement I** is incorrect, **Statement II** is correct
3.	**Statement I** is correct, **Statement II** is incorrect
4.	**Statement I** is incorrect, **Statement II** is incorrect

70 Heart of a frog:

I:	has three chambers
II:	is a muscular pump
III:	is covered by pericardium

1. Only **I** and **II** are correct
2. Only **I** and **III** are correct
3. Only **II** and **III** are correct
4. **I**, **II** and **III** are correct

71 Unlike RBCs in humans, the RBCs of frog:

I:	are nucleated
II:	contain haemoglobin

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

72 The excretory product eliminated by a frog is:

1.	Ammonia	2.	Urea
3.	Uric acid	4.	Creatine

73 The excretory system of a frog consists of all of the following, except:

1.	a pair of kidneys	2.	a pair of urethra
3.	a single median cloaca	4.	urinary bladder

74 The thin-walled urinary bladder in frog is present:

1.	ventral to the rectum which does not open in the cloaca.
2.	ventral to the rectum which also opens in the cloaca.
3.	dorsal to the rectum which does not open in the cloaca.
4.	dorsal to the rectum which also opens in the cloaca.

75 The number of cranial nerves in frogs is:

1.	8 pairs	2.	10 pairs
3.	11 pairs	4.	12 pairs

76 The mid brain of frog is characterised by:

1.	a pair of olfactory lobes
2.	paired cerebral hemispheres
3.	unpaired diencephalon
4.	a pair of optic lobes

77 Unlike human brain, which of the following structure is not a feature of a frog's brain?

1.	Cerebellum	2.	Pons varolii
3.	Medulla oblongata	4.	Olfactory lobes

78 The forebrain of frog does not include:

1.	olfactory lobes	2.	cerebral hemispheres
3.	diencephalon	4.	cerebellum

79 The nervous system of a frog is organised into:

I:	central nervous system	brain and spinal cord
II:	peripheral nervous system	cranial and spinal nerves
III:	autonomic nervous system	sympathetic and parasympathetic

1.	Only **I** and **II**	2.	Only **I** and **III**
3.	Only **II** and **III**	4.	**I**, **II** and **III**

80 The opening in the skull of the frog through which the medulla oblongata passes out and continues into the spinal cord is called as:

1.	Foramen ovale	2.	Foramen spinosum
3.	Foramen magnum	4.	Obturator foramen

81 Which of the following sense organs in frogs are well-organised structures rather than cellular aggregations around nerve endings?

I:	Sensory papillae for touch
II:	Taste buds
III:	Nasal epithelium
IV:	Eyes
V:	Tympanum with internal ears

1.	Only **I**, **II** and **III**	2.	Only **IV** and **V**
3.	Only **II**, **IV** and **V**	4.	Only **IV**

82 Eyes in a frog:

I:	are situated in the orbit in skull.
II:	are compound eyes possessing a large number of units.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

83 Regarding ear in frog:

I:	External ear is absent.
II:	Only tympanum can be seen externally.
III:	The ear is an organ of hearing but not of balancing (equilibrium).

1. Only **I** and **II** are correct
2. Only **I** and **III** are correct
3. Only **II** and **III** are correct
4. **I, II** and **III** are correct

84 In frogs, vasa efferentia:

I:	are 100-120 in number that arise from testes
II:	enter the kidneys on their side and open into Bidder's canal

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

85 The cloaca in a frog is a small, median chamber that is used to pass:

1.	only faecal matter to the exterior.
2.	only faecal matter and urine but not sperms to the exterior.
3.	faecal matter, urine and sperms to the exterior.
4.	faecal matter and sperms but not urine to the exterior.

86 Mesorchium in frogs:

1.	is a double fold of peritoneum that adheres testes to kidney.
2.	is a double fold of peritoneum that adheres ovaries to kidney.
3.	is the outer cortical part of testes.
4.	is the outer cortical part of ovaries.

87 A pair of oviducts arising from the ovaries in female frogs:

1.	join to form a single median duct that opens into the cloaca.
2.	opens into the cloaca separately.
3.	opens separately to the exterior through the skin.
4.	join to form a single median duct that opens into Bidder's canal.

88 Consider the two statements:

Statement I:	In male frogs, the testes are found adhered to the upper part of the kidneys and have a functional connection with the kidneys.
Statement II:	In female frogs, the ovaries are situated near the kidneys and there is no functional connection with the kidneys.

1.	**Statement I** is correct, **Statement II** is correct
2.	**Statement I** is incorrect, **Statement II** is correct
3.	**Statement I** is correct, **Statement II** is incorrect
4.	**Statement I** is incorrect, **Statement II** is incorrect

89 The number of ova that can be laid by a mature female frog at a time varies between:

1.	100 to 200	2.	750 to 1250
3.	2500 to 3000	4.	8000 to 10000

90 Frogs are beneficial for mankind because:

1.	they are an important source of food all over the world.
2.	toxins derived from them can cure many human ailments.
3.	while burrowing, they loosen soil in arid environments making the soil highly fertile.
4.	they eat insects and protect the crop.

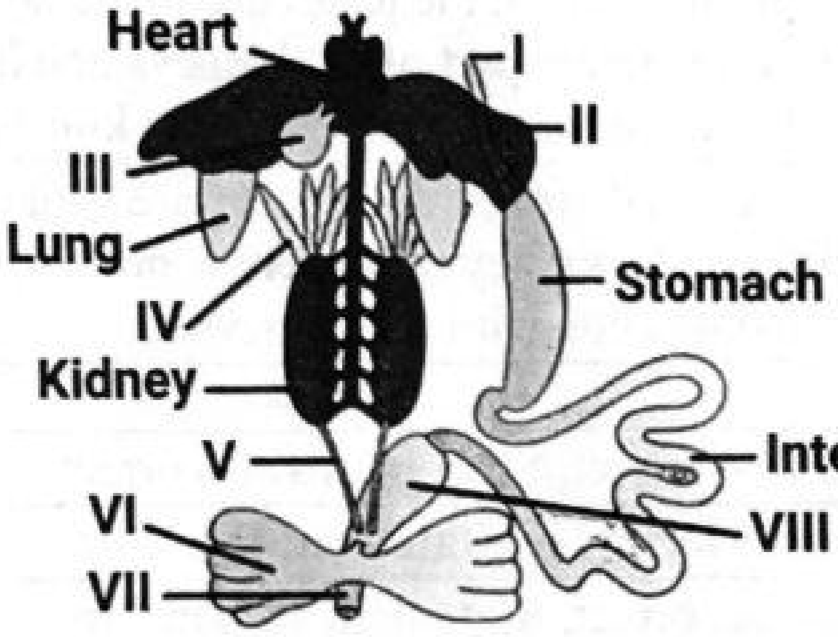
91 Given below are two statements:

Assertion (A):	Frogs help maintain ecological balance.
Reason (R):	Frogs serve as an important link in the food chain and food web in the ecosystem.

In the light of the above statements choose the correct answer from the options given below:

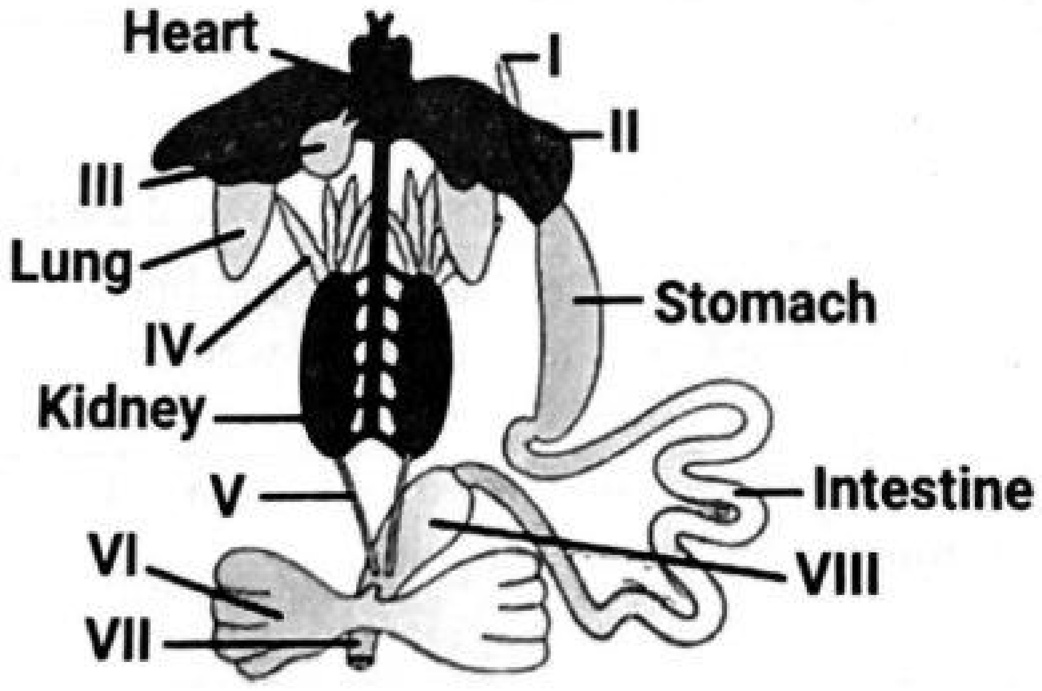
1.	**(A)** is True but **(R)** is False.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
4.	**(A)** is False but **(R)** is True.

92 In the given diagrammatic representation of internal organs of a frog showing the complete digestive system, identify I, II, III, IV:


Heart
I
II
III
Lung
IV
Stomach
Kidney
V
Intestine
VI
VIII
VII

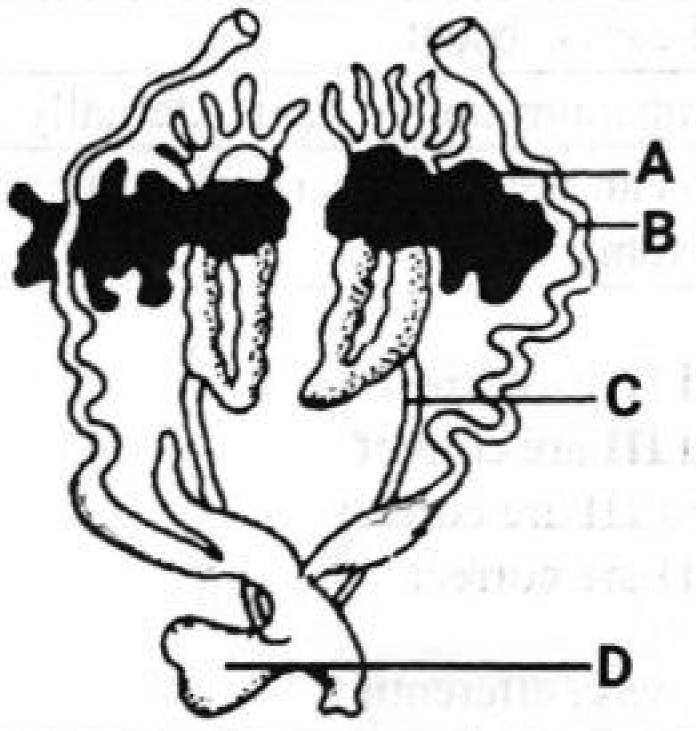
	I	II	III	IV
1.	Oesophagus	Liver	Gall bladder	Fat bodies
2.	Pharynx	Liver	Gall bladder	Uricose glands
3.	Buccal cavity	Gall bladder	Liver	Antennal glands
4.	Oesophagus	Gall bladder	Liver	Fat bodies

93 In the given diagrammatic representation of internal organs of a frog showing complete digestive system, identify V, VI, VII, VIII:


Heart
I
II
III
Lung
IV
Stomach
Kidney
V
Intestine
VI
VIII
VII

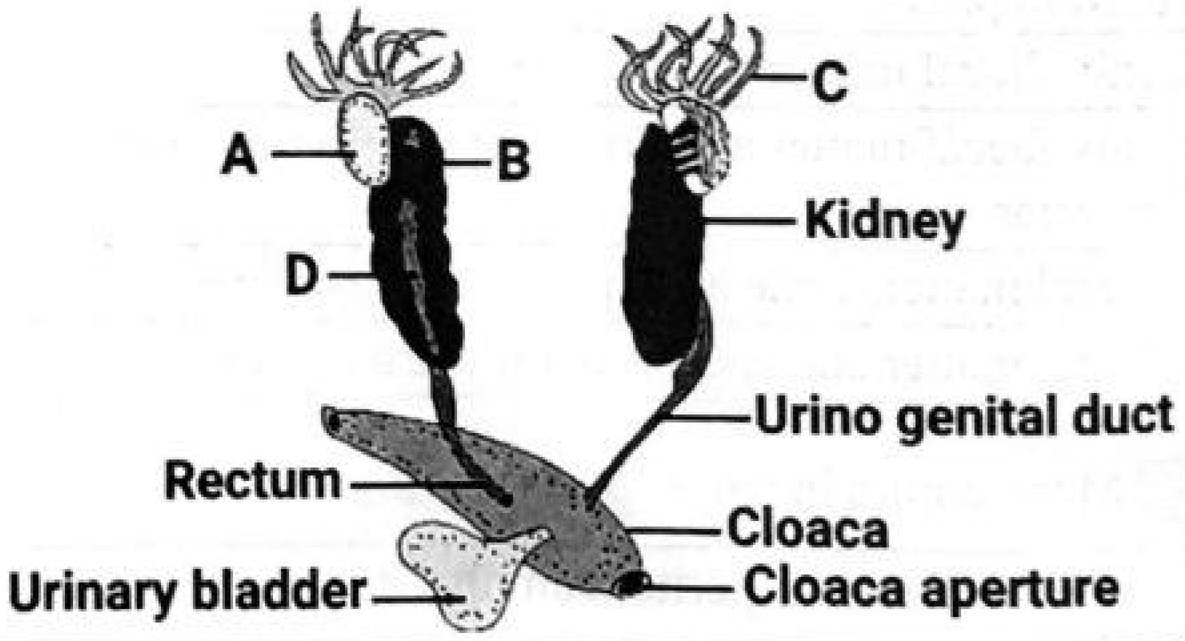
	V	VI	VII	VIII
1.	Uterus	Urinary bladder	Rectum	Cloaca
2.	Ureter	Urinary bladder	Rectum	Cloaca
3.	Ureter	Urinary bladder	Cloaca	Rectum
4.	Urethra	Urinary bladder	Cloaca	Rectum

94 The figure shows the female reproductive system of a frog. Identify A, B, C and D:



	A	B	C	D
1.	Ova	Ovary	Ureter	Urinary bladder
2.	Ovary	Oviduct	Ureter	Urinary bladder
3.	Ova	Oviduct	Urethra	Urinary bladder
4.	Ova	Oviduct	Ureter	Cloaca

95 The figure shows the male reproductive system of a frog. Identify A, B, C, and D:


A
B
C
D
Kidney
Urino genital duct
Rectum
Cloaca
Urinary bladder
Cloaca aperture

	A	B	C	D
1.	Testis	Vas deferens	Fat bodies	Pituitary gland
2.	Fat bodies	Vasa efferentia	Testis	Adrenal gland
3.	Testis	Vas deferens	Fat bodies	Adrenal gland
4.	Testis	Vasa efferentia	Fat bodies	Adrenal gland

96 Frogs:

I:	have a constant body temperature and are warm blooded.
II:	have the ability to change the colour to hide them from their enemies (camouflage).
III:	are not seen during peak summer and winter.

1. Only **I** and **II** are correct
2. Only **I** and **III** are correct
3. Only **II** and **III** are correct
4. **I, II** and **III** are correct

97 Consider the given two statements:

Assertion (A):	The alimentary canal in frog is short.
Reason (R):	Frog is a herbivore.

1.	Both **(A)** and **(R)** are True and **(R)** explains **(A)**
2.	Both **(A)** and **(R)** are True and **(R)** does not explain **(A)**
3.	**(A)** is True but **(R)** is False
4.	**(A)** is False but **(R)** is True

98 In frogs:

I:	neck and tail are absent.
II:	a pair of nostrils is present.
III:	a membranous tympanum (ear) receives sound signals.

1. Only **I** and **II** are correct
2. Only **I** and **III** are correct
3. Only **II** and **III** are correct
4. **I, II** and **III** are correct

99 Consider the given two statements:

Statement I:	The frog never drinks water but absorb it through the skin.
Statement II:	In frog, the skin is always maintained in a moist condition.

1. **Statement I** is correct; **Statement II** is correct
2. **Statement I** is correct; **Statement II** is incorrect
3. **Statement I** is incorrect; **Statement II** is correct
4. **Statement I** is incorrect; **Statement II** is incorrect

100 Consider the given two statements regarding frogs:

Statement I:	In water, skin acts as aquatic respiratory organ (cutaneous respiration).
Statement II:	On land, the buccal cavity, skin and lungs act as the respiratory organs.

1. **Statement I** is correct; **Statement II** is correct
2. **Statement I** is correct; **Statement II** is incorrect
3. **Statement I** is incorrect; **Statement II** is correct
4. **Statement I** is incorrect; **Statement II** is incorrect

101 Consider the given two statements:

Statement I:	The fore limbs in frogs end in five digits and they are larger and muscular than hind limbs that end in four digits.
Statement II:	Feet in frogs have webbed digits that help in swimming.

1. **Statement I** is correct; **Statement II** is correct
2. **Statement I** is correct; **Statement II** is incorrect
3. **Statement I** is incorrect; **Statement II** is correct
4. **Statement I** is incorrect; **Statement II** is incorrect

102 The frog has:

I:	Hepatic portal system
II:	Renal portal system

1.	Only **I** is correct	2.	Only **II** is correct
3.	Both **I** and **II** are correct	4.	Both **I** and **II** are incorrect

103 The number of cranial nerves in frogs are:

1.	8 pairs	2.	10 pairs
3.	12 pairs	4.	31 pairs

104 Forebrain in frogs does not include:

1.	olfactory lobes
2.	paired cerebral hemispheres
3.	unpaired diencephalon
4.	a pair of optic lobes

105 In frogs:

1.	the heart is two chambered
2.	lymphatic system is absent
3.	sinus venosus joins the right atrium
4.	RBCs are not nucleated and do not contain haemoglobin

106 Consider the given two statements:

Assertion (A):	The gastro-intestinal tract of *Rana tigrina* is short in length.
Reason (R):	*Rana tigrina* is a carnivore.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**
2.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
3.	**(A)** is True; **(R)** is False
4.	Both **(A)** and **(R)** are False

107 In frogs:

I: The olfactory lobe is a part of forebrain.
II: The optic lobe is a part of midbrain.
1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

108 What is the number of pairs of cranial nerves in frogs?

1.	8	2.	10
3.	11	4.	12

109 How many of the given statements regarding the anatomy of frogs are correct?

A:	Kidneys are situated a little posteriorly in the body cavity on both sides of the vertebral column.
B:	Each kidney is composed of several structural and functional units called uriniferous tubules or nephrons.
C:	Two ureters emerge from the kidneys in male frogs, where the ureters act as urinogenital ducts that open into the cloaca.
D:	In females, the ureters and oviduct open separately in the cloaca.

1.	1	2.	2
3.	3	4.	4

110 Trace the correct path of passage of the sperm in male *Rana tigrina*:

1.	Testes → Vasa efferentia → Kidney → Seminal vesicle → Urogenital duct → Cloaca
2.	Testes → Vasa efferentia → Bidder's canal → Ureter → Cloaca
3.	Testes → Vasa efferentia → Kidney → Bidder's canal → Urogenital duct → Cloaca
4.	Testes → Bidder's canal → Kidney → Vasa efferentia → Urogenital duct → Cloaca

111 Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R):

Assertion (A):	Frogs help maintain ecological balance.
Reason (R):	Frogs serve as an important link in the food chain and food web in the ecosystem.

In the light of the above statements choose the correct answer from the options given below:

1.	**(A)** is True but **(R)** is False.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
4.	**(A)** is False but **(R)** is True.

112 Most digestion in frog occurs in:

1.	Oesophagus	2.	Stomach
3.	Small intestine	4.	Rectum

113 Being cold-blooded, frogs have to adopt suitable behaviour patterns to regulate their temperature.
Which of the following will be true?

I:	To warm up, they can move into the sun or onto a warm surface; if they overheat, they can move into the shade.
II:	In cool damp conditions, the colour of the skin will be lighter than on a hot dry day.

1. **Statement I** is correct; **Statement II** is incorrect
2. **Statement I** is correct; **Statement II** is correct
3. **Statement I** is incorrect; **Statement II** is incorrect
4. **Statement I** is incorrect; **Statement II** is correct

114 Consider the given two statements:

Assertion (A):	Many environmental scientists believe amphibians, including frogs, are good biological indicators of broader ecosystem health.
Reason (R):	These organisms have intermediate positions in food chains, have permeable skins, and typically have biphasic lives (aquatic larvae and terrestrial adults).

1.	**(A)** is True but **(R)** is False
2.	Both **(A)** and **(R)** are True and **(R)** explains **(A)**
3.	**(A)** is False but **(R)** is True
4.	Both **(A)** and **(R)** are True but **(R)** does not explain **(A)**

115 Identify whether the given statements are true [T] or false [F] regarding frog:

I:	Bile emulsifies fat.
II:	Pancreatic juices digest carbohydrates and proteins.
III:	Digested food is absorbed by the numerous finger-like folds in the inner wall of intestine called villi and microvilli.
IV:	The undigested solid waste moves into the rectum and passes out through cloaca.

	I	**II**	**III**	**IV**
1.	T	T	F	T
2.	F	T	T	F
3.	T	T	T	T
4.	T	F	F	T

116 Many parts of frog brains correspond with those of humans. Which structure of human brain has no corresponding structure in frogs?

1.	Olfactory lobe	2.	Optic lobe
3.	Pons	4.	Cerebellum

117 Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R):

Assertion (A):	The alimentary canal in frogs is short.
Reason (R):	Frogs are carnivores.

In the light of the above statements choose the correct answer from the options given below:

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	Both **(A)** and **(R)** are False.

118 Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R):

Assertion (A):	The skin of a frog is always kept moist and has a mucus covering.
Reason (R):	Frogs respire through the skin as well.

In the light of the above statements choose the correct answer from the options given below:

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	Both **(A)** and **(R)** are False.

119 Twelve pairs of cranial nerves are present in all the following except:

1.	Mammals	2.	Birds
3.	Reptiles	4.	Amphibians

120 Tadpoles are typically:

1.	carnivorous	2.	filter feeders
3.	sanguinivorous	4.	herbivorous

121 Frogs that live in or visit water have adaptations that improve their swimming abilities. Which of the following will be true in this regard?

I:	The hind limbs are heavily muscled and strong.
II:	The webbing between the toes of the hind feet increases the area of the foot and helps propel the frog powerfully through the water.

1.	Only **I**	2.	Only **II**
3.	Both **I** and **II**	4.	Neither **I** nor **II**

122 In frog:

1.	Fertilisation is external, takes place in water while development involves a larval stage called tadpole that undergoes metamorphosis to form the adult.
2.	Fertilisation is internal, takes place inside the female body while development involves a larval stage called tadpole that undergoes metamorphosis to form the adult.
3.	Fertilisation is external, takes place in water while development involves a larval stage called instar that undergoes paurometabolous metamorphosis to form the adult.
4.	Fertilisation is internal, takes place inside the female body while development involves a larval stage called instar that moults 13 times to form the adult.

123 Frogs have three-chambered hearts. What is correct regarding circulatory pathways in frogs?

I:	Oxygenated blood from the lungs and de-oxygenated blood from the respiring tissues enter the heart through separate atria.
II:	When atria contract, the two blood streams pass into a common ventricle.
III:	From the ventricle the blood is pumped via a spiral valve to the appropriate vessel, the aorta for oxygenated blood and pulmonary artery for deoxygenated blood.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

124 Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R):

Assertion (A):	Frogs are at their most vulnerable to predators when they are undergoing metamorphosis.
Reason (R):	At this time, the tail is being lost and locomotion by means of limbs is only just becoming established.

In the light of the above statements, choose the correct answer from the options given below:

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	**(A)** is False but **(R)** is True.

125 Identify the correct statements:

Statement I:	Frog eye does not have closable eye lids.
Statement II:	A nictitating membrane provides protection to the eye, especially when the frog is swimming.

1. **Statement I** is correct; **Statement II** is incorrect
2. **Statement I** is incorrect; **Statement II** is incorrect
3. **Statement I** is correct; **Statement II** is correct
4. **Statement I** is incorrect; **Statement II** is correct

126 The larvae that emerge from the eggs, known as tadpoles:

I:	lack eyelids and limbs
II:	have cartilaginous skeletons
III:	use gills for respiration
IV:	have tails

1. Only **I, II** and **III** are correct
2. Only **I, III** and **IV** are correct
3. Only **II, III** and **IV** are correct
4. **I, II, III** and **IV** are correct

127 What is correct regarding the skin of frog [*Rana tigrina*]?

1.	It is dry with scales.
2.	The colour of ventral side of body is generally olive green with dark irregular spots.
3.	On the dorsal side the skin is uniformly pale yellow.
4.	The frog never drinks water but absorbs it through the skin.

128 Consider the given two statements:

Statement I:	Frogs do not have a lymphatic system.
Statement II:	Frogs do not have a portal system.

1.	**Statement I** is correct; **Statement II** is incorrect
2.	**Statement I** is correct; **Statement II** is correct
3.	**Statement I** is incorrect; **Statement II** is incorrect
4.	**Statement I** is incorrect; **Statement II** is correct

129 Frogs exhibit sexual dimorphism where:

1.	Male frogs have a copulatory pad on the first digit of the fore limbs which are absent in female frogs
2.	Female frogs have a copulatory pad on the first digit of the fore limbs which are absent in male frogs
3.	Male frogs have a copulatory pad on the first digit of the hind limbs which are absent in female frogs
4.	Female frogs have a copulatory pad on the first digit of the hind limbs which are absent in male frogs

130 The forebrain of frog does not include:

1.	olfactory lobes	2.	cerebral hemispheres
3.	diencephalon	4.	optic lobes

131 Identify the correct statements regarding the frog:

I:	In water, the skin acts as an aquatic respiratory organ (cutaneous respiration).
II:	On land, the buccal cavity, skin and lungs act as the respiratory organs.

1.	Only **I**	2.	Only **II**
3.	Both **I** and **II**	4.	Neither **I** nor **II**

132 Regarding frog:

I: They do not have a lymphatic system.
II: They have a very long alimentary canal.
1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

133 Which of the following statements correctly describes the skin of a frog?

1.	The skin of frogs is dry and scaly, providing protection against predators.
2.	Frogs have a moist skin covered with mucous glands that helps in respiration and protection against bacterial infection.
3.	The skin of frogs is adapted to absorb water directly, eliminating the need for drinking.
4.	Frogs possess a thick, keratinized skin that aids in terrestrial survival during dry conditions.

134 Consider the given two statements:

Assertion (A):	Frogs undergo summer sleep and winter sleep.
Reason (R):	Frogs are endotherms.

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	**(A)** is False but **(R)** is True.

135 How many of the given statements regarding frog are correct?

A:	The frog never drinks water but absorbs it through the skin.
B:	Frogs respire through skin when in water.
C:	The vascular system of frog is well-developed closed type.
D:	In male frogs, the ureters act as urogenital duct.
E:	The ear is an organ of hearing as well as balancing.

1. 2
2. 3
3. 4
4. 5

136 Which organ is primarily used by frogs for gas exchange when they are active on land?

1. Skin
2. Lungs
3. Buccal cavity
4. Gills

137 Consider the following statements about the reproductive system of a male frog and choose the correct option:

I:	The male frog has a pair of testes which are attached to the kidneys by a structure called mesorchium.
II:	The male frog's sperm travels through the urethra which also carries urine.
III:	External fertilization occurs, and the frog's sperm are released directly into the surrounding water.

1. Only **I** and **II** are correct.
2. Only **I** and **III** are correct.
3. Only **II** and **III** are correct.
4. All statements are correct.

138 The ventricle in the heart of the frog opens into a sac-like structure called as:

1. Sinus Venosus
2. Conus Arteriosus
3. Truncus Arteriosus
4. Vasa Vasorum

139 How many of the given statements regarding the digestive system of frog are correct?

1.	The alimentary canal is short because frogs are carnivores.
2.	Liver secretes bile that is stored in the gallbladder.
3.	Food is captured by the bi-lobed tongue.
4.	The duodenum receives bile from gallbladder and pancreatic juice from pancreas through a common bile duct.
5.	The undigested solid waste moves into the rectum and passes through cloaca.

1. 2
2. 3
3. 4
4. 5

140 The digestive system of a frog is characterized by:

1. The absence of a stomach
2. A three-chambered heart
3. The presence of both a liver and a pancreas
4. The lack of salivary glands

141 How do frogs primarily excrete nitrogenous waste?

1.	As ammonia through the skin when submerged in water.
2.	As urea through the kidneys.
3.	As uric acid via the cloaca.
4.	As urea through the skin.

142 Identify the incorrect statement about frog:

1.	During aestivation and hibernation, gaseous exchange takes place through skin.
2.	Forebrain includes olfactory lobes, paired cerebral hemispheres and unpaired diencephalon.
3.	The urinary bladder is present dorsal to the rectum which also opens in the cloaca.
4.	A mature female can lay 2500 to 3000 ova at a time.

143 Consider the given two statements

Assertion (A):	The metamorphosis in a frog is not regarded as holometabolous.
Reason (R):	Frog metamorphosis does not involve a pupa stage.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
3.	**(A)** is True, **(R)** is False.
4.	**(A)** is False, **(R)** is False.

144 The number of ova, a mature female frog can lay at a time, may reach up to

1.	20	2.	500
3.	1000	4.	3000

145 In the reproductive system of female frogs, which of the following statements is true?

1.	The oviducts open directly into the coelom.
2.	Females have a single ovary.
3.	Eggs are fertilized internally.
4.	Eggs are laid and fertilized externally in water.

146 Which of the following statements accurately describes the male reproductive system of a frog?

1.	The testes produce eggs and are attached to kidneys.
2.	The male frog has a pair of testes which are connected to the ventral side of the kidneys by a structure called mesorchium.
3.	The testes produce spermatozoa, and the reproductive process is facilitated by a pair of seminal vesicles.
4.	The vasa efferentia transport urine from the kidneys to the urinary bladder.

147 Male frogs can be distinguished from the female frogs by the presence of

A:	A sound-producing vocal sac
B:	A copulatory pad on the first digit of the forelimbs

1. Only **A** is correct
2. Only **B** is correct
3. Both **A** and **B** are correct
4. Both **A** and **B** are incorrect

148 What is the location and function of compound eyes in arthropods?

1.	Located on the head, used for detecting light and shadow only.
2.	Located on the thorax, used for complex visual processing.
3.	Located on the head, used for detailed and panoramic vision.
4.	Located on the abdomen, used primarily for movement detection.

149 Which part of the frog's brain is responsible for maintaining balance and posture?

1.	Cerebrum	2.	Cerebellum
3.	Medulla oblongata	4.	Olfactory lobes

150 Identify the correct statements regarding frog:

I:	The ear in frog is an organ of hearing but not of balancing.
II:	There are 10 pairs of cranial nerves arising from the brain in a frog.

1. Only **I**
2. Only **II**
3. Both **I** and **II**
4. Neither **I** nor **II**

151 The frog's nervous system is categorised as:

1.	Exclusively autonomic nervous system
2.	Only central nervous system
3.	Central nervous system with paired nerves in peripheral nervous system
4.	Central nervous system with unpaired nerves in peripheral nervous system

152 Which of the following statements about respiration in frogs is true?

1.	Frogs respire only through their skin and not through lungs.
2.	Adult frogs use their lungs for respiration, but can also respire through their moist skin.
3.	Frogs cannot respire through their skin; they rely solely on their lungs.
4.	The respiration in frogs is identical to that in humans, relying entirely on pulmonary ventilation.

COCKROACH

153 Which of the following will be true for *Periplaneta americana*?

I:	Nocturnal omnivores
II:	Serious pests and vectors of several diseases

1. Only **I**
2. Only **II**
3. Both **I** and **II**
4. Neither **I** nor **II**

154 In *Periplaneta americana*:

I:	Flat extension of the upper body wall conceals head.
II:	Wings extend beyond the tip of the abdomen in females.

1.	Only **I**	2.	Only **II**
3.	Both **I** and **II**	4.	Neither **I** nor **II**

155 The dorsal sclerites in *Periplaneta americana* are called as:

1.	Sternites	2.	Tergites
3.	Pleurites	4.	Arthroidal membranes

156 In cockroach, a chitinous hard exoskeleton covers:

1. The head segment only
2. The head and the thorax segment only
3. The thorax and the abdomen only
4. The entire body

157 Consider the given statements:

Statement I:	The head of cockroach is at right angle to the longitudinal body axis.
Statement II:	The head of cockroach is formed by the fusion of six segments.

1. Only **Statement I** is correct
2. Only **Statement II** is correct
3. Both **Statement I** and **Statement II** are correct
4. Both **Statement I** and **Statement II** are incorrect

158 Which of the following mouth parts of cockroach are paired?

1.	Labrum	2.	Labium
3.	Hypopharynx	4.	Maxilla

159 In cockroach:

I:	The head capsule bears a pair of compound eyes.
II:	A pair of antennae arise from the membranous sockets lying in front of the eyes.
III:	Mouth parts are biting and chewing type.

1. Only **I** and **II** are correct
2. Only **I** and **III** are correct
3. Only **II** and **III** are correct
4. **I, II** and **III** are correct

160 Which mouth part of cockroach acts as a tongue?

1. Labrum	2. Labium
3. Maxilla	4. Hypopharynx

161 Consider the given statements:

Statement I:	Each thoracic segment in cockroach bears a pair of walking legs.
Statement II:	The first pair of wings arises from prothorax and they are called as tegmina.

1. Only **statement I** is correct
2. Only **statement II** is correct
3. Both **statement I** and **statement II** are correct
4. Both **statement I** and **statement II** are incorrect

162 The tegmina in *Periplaneta americana* are:

1.	Mesothoracic forewings not used in flight
2.	Mesothoracic forewings used in flight
3.	Metathoracic hindwings not used in flight
4.	Metathoracic hindwings used in flight

163 The genital pouch in the female cockroach does not have:

1. Gonopore
2. Phallomeres
3. Collateral glands opening
4. Spermethecal pores

164 Anal cerci in *Periplaneta americana*:

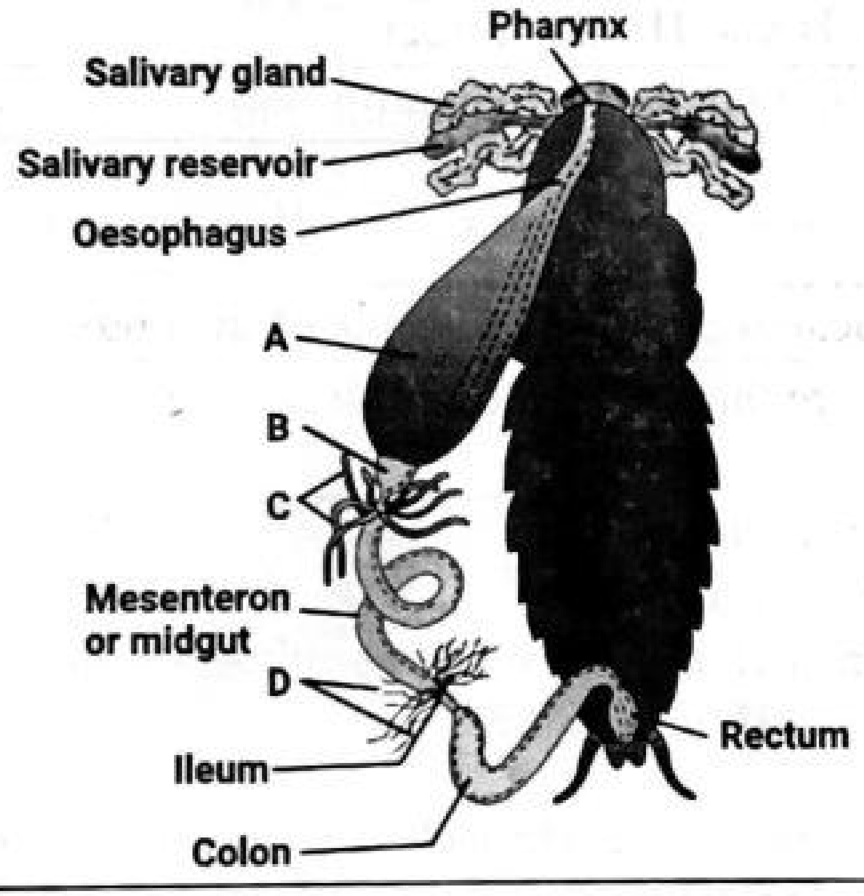
1.	are present in the 9th segment in both sexes
2.	are present only in males
3.	are present in the 10th segment in both sexes
4.	are present only in females

165 In cockroach:

I:	The abdomen in both males and females has ten segments.
II:	In females, the seventh sternum is boat shaped and together with eighth and ninth sterna forms a brood or genital pouch.
III:	In males, genital pouch of chamber is bounded dorsally by ninth and tenth terga and ventrally by ninth sternum.

1. Only **I** and **II** are correct
2. Only **I** and **III** are correct
3. Only **II** and **III** are correct
4. **I, II** and **III** are correct

166 In the given diagram of alimentary canal of cockroach, A,B, C and D respectively are:



1.	Gizzard, Crop, Hepatic cecae and Malpighian tubules
2.	Gizzard, Crop, Malpighian tubules and Hepatic cecae
3.	Crop, Gizzard, Hepatic cecae and Malpighian tubules
4.	Crop, Gizzard, Malpighian tubules and Hepatic cecae

167 Consider the given statements:

I:	The crop in the alimentary canal of cockroach is also known as proventriculus, has six highly chitinous plates called teeth and helps in grinding food particles.
II:	The gizzard is sac-like structure used for storing food in cockroach.

1.	Only **I** is correct
2.	Only **II** is correct
3.	Both **I** and **II** are correct
4.	Both **I** and **II** are incorrect

168 Consider the given statements:

I:	Malpighian tubules are used in osmoregulation and excretion in cockroach.
II:	Malpighian tubules are present at the junction of the midgut and the hindgut in the alimentary canal of cockroach.

1.	Only **I** is correct
2.	Only **II** is correct
3.	Both **I** and **II** are correct
4.	Both **I** and **II** are incorrect

169 In cockroach:

I:	Gastric or hepatic caeca are 6 to 8 in number and present at the junction of mid gut and hind gut.
II:	Malpighian tubules are 100 to 150 in number and present at the junction of fore gut and mid gut.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

170 In cockroach:

I:	The entire foregut is lined by cuticle.
II:	The hind gut is broader than midgut and is differentiated into ileum, colon and rectum.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

171 Which of the following is not true about the blood vascular system of cockroach?

1.	It is of open type.
2.	It delivers oxygen to the tissues.
3.	Heart lies along the mid dorsal line of thorax and abdomen.
4.	The haemolymph is composed of colourless plasma and haemocytes.

172 Consider the given two statements:

Assertion(A):	The cockroach has an open circulatory system with hemolymph.
Reason(R):	Open circulatory systems are more efficient for transport in large and active animals.

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	**(A)** is False but **(R)** is True.

173 In *Periplaneta americana*:

1.	malpighian tubules do not play any role in osmoregulation
2.	blood vascular system does not deliver oxygen to the tissues
3.	mosaic vision does not have high sensitivity
4.	the nymph does not grow by moulting

174 In cockroach:

I:	The haemolymph is composed of colourless plasma and haemocytes.
II:	The heart lies along mid ventral line of thorax and abdomen.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

175 Regarding the respiratory system of cockroach:

I:	It consists of a network of trachea that open through 12 pairs of spiracles present on ventral side of the body.
II:	The opening of spiracles is regulated by sphincters.
III:	Exchange of gases takes place at the tracheoles by diffusion.

1. Only **I** and **II** are correct
2. Only **I** and **III** are correct
3. Only **II** and **III** are correct
4. **I, II** and **III** are correct

176 In cockroach:

I:	Malpighian tubules are lined by glandular and ciliated cells.
II:	Uric acid is the nitrogenous metabolic excretory product.
III:	Fat body, nephrocytes and urecose glands also help in excretion.

1.	Only **II** is correct
2.	Only **I** and **II** are correct
3.	Only **II** and **III** are correct
4.	**I, II** and **III** are correct

177 Regarding the neural system of cockroach:

I:	It is located on the ventral side of the body.
II:	There are three thoracic ganglia and six abdominal ganglia.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

178 If the head of cockroach is removed, it may live for few days because:

1.	The cockroach does not have a nervous system.
2.	The head holds a small proportion of a nervous system while the rest is situated along the ventral part of its body.
3.	The head holds a third of the nervous system while the rest is situated along the dorsal part of its body.
4.	The supra-oesophageal ganglia of the cockroach are situated in ventral part of abdomen.

179 In cockroach:

I:	the head is represented by sub-oesophageal ganglion.
II:	the nerve cord is located on the dorsal side of the body.

1. Only **II** is correct
2. Only **I** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

180 Ommatidia are:

1. simple eyes of cockroach
2. compound eyes of cockroach
3. subunits of compound eyes in cockroach
4. subunits of simple eyes in cockroach

181 Consider the given two statements:

I:	The vision in cockroach can be best described as a mosaic vision.
II:	This is a nocturnal vision with more sensitivity but less resolution.

1. Both **I** and **II** are correct and **II** explains **I**
2. Both **I** and **II** are correct but **II** does not explain **I**
3. Both **I** and **II** are incorrect
4. **II** is incorrect and **I** is correct

182 Which of the following is not a part of male cockroach reproductive system?

1. Phallic gland
2. Collaterial gland
3. Mushroom gland
4. Phallomeres

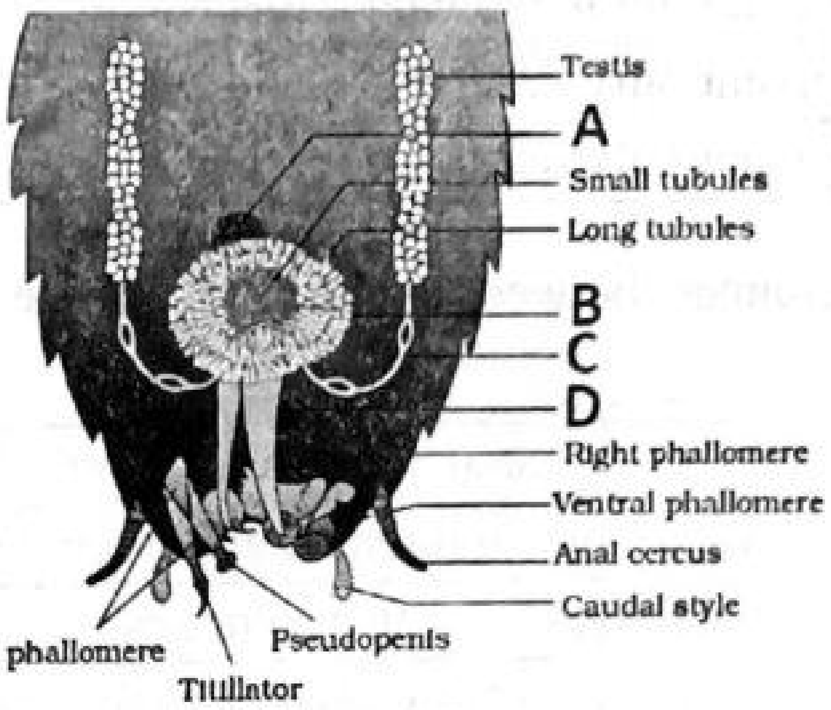
183 Which of the following is not a part of female cockroach reproductive system?

1. Oviduct
2. Spermathecae
3. Seminal vesicles
4. Ovarioles

184 The fertilized eggs of cockroach are encased in capsules called:

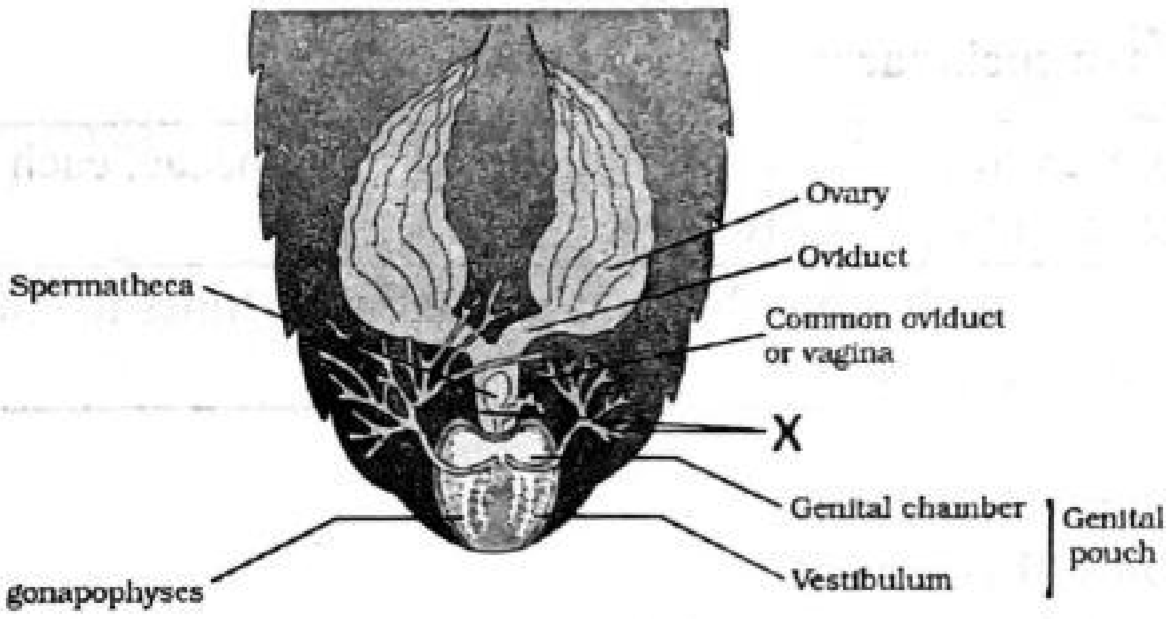
1.	Oothecae	2.	Spermathecae
3.	Spermatophores	4.	Ovarioles

185 Ejaculatory duct in the given diagram is represented by the letter:


Testis
A
Small tubules
Long tubules
B
C
D
Right phallomere
Ventral phallomere
Anal cercus
Caudal style
Left phallomere
Pseudopenis
Titillator

1. A
2. B
3. C
4. D

186 What is 'X' in the given diagram?


Ovary
Oviduct
Spermatheca
Common oviduct or vagina
X
Genital chamber
Vestibulum
Genital pouch
gonapophyses

1.	Collateral Gland	2.	Phallic Gland
3.	Mushroom Gland	4.	Corpora Allata

187 Identify the incorrectly matched pair regarding reproductive structures in *Periplaneta americana*:

	Structure	**Body segment**
1.	Testes	4th – 6th abdominal
2.	Ovaries	4th – 6th abdominal
3.	Mushroom gland	6th – 7th abdominal
4.	Spermatheca	6th abdominal

188 Anal styles are borne on the:

1.	9th segment only in female cockroach
2.	9th segment only in male cockroach
3.	10th segment only in female cockroach
4.	10th segment only in male cockroach

189 Differences between male and female cockroach morphology include:

1.	Males have a pair of anal styles, which females lack
2.	Females have a more segmented abdomen than males
3.	Males are generally larger than females
4.	Females have a pair of cerci, which males lack

190 Which one of the followings statements is true for cockroach?

1.	The numbers of ovarioles in each ovary are ten.
2.	The larval stage is called caterpillar.
3.	Anal styles are absent in females.
4.	They are ureotelic.

191 In cockroach:

I:	On average, females produce 9 to 10 oothecae, each containing 14 to 16 eggs.
II:	The nymph grows by moulting about 13 times to reach adult form.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

192 The development of *Periplaneta americana* is:

1.	Paurometabolous with nymph moulting about 13 times to reach the adult form and the next to last nymphal stage has wing pads.
2.	Paurometabolous with nymph moulting about 13 times to reach the adult form and the next to last nymphal stage has wings.
3.	Holometabolous with nymph moulting about 13 times to reach the adult form and the next to last nymphal stage has wing pads.
4.	Holometabolous with nymph moulting about 13 times to reach the adult form and the next to last nymphal stage has wings.

STRUCTURAL ORGANISATION IN ANIMALS - ANSWER KEY

1.	(2)	2.	(3)	3.	(1)	4.	(1)	5.	(1)	6.	(3)	7.	(2)	8.	(3)	9.	(3)	10.	(3)
11.	(3)	12.	(3)	13.	(3)	14.	(4)	15.	(1)	16.	(4)	17.	(1)	18.	(2)	19.	(1)	20.	(1)
21.	(3)	22.	(4)	23.	(1)	24.	(4)	25.	(3)	26.	(2)	27.	(3)	28.	(3)	29.	(2)	30.	(2)
31.	(1)	32.	(3)	33.	(4)	34.	(4)	35.	(1)	36.	(2)	37.	(3)	38.	(3)	39.	(4)	40.	(1)
41.	(2)	42.	(1)	43.	(1)	44.	(2)	45.	(3)	46.	(1)	47.	(1)	48.	(4)	49.	(1)	50.	(2)
51.	(2)	52.	(1)	53.	(1)	54.	(4)	55.	(3)	56.	(1)	57.	(4)	58.	(1)	59.	(1)	60.	(3)
61.	(2)	62.	(1)	63.	(2)	64.	(1)	65.	(4)	66.	(2)	67.	(2)	68.	(4)	69.	(3)	70.	(4)
71.	(1)	72.	(2)	73.	(2)	74.	(2)	75.	(2)	76.	(4)	77.	(2)	78.	(4)	79.	(4)	80.	(3)
81.	(2)	82.	(1)	83.	(1)	84.	(2)	85.	(3)	86.	(1)	87.	(2)	88.	(1)	89.	(3)	90.	(4)
91.	(3)	92.	(1)	93.	(3)	94.	(2)	95.	(4)	96.	(3)	97.	(3)	98.	(4)	99.	(1)	100.	(1)
101.	(3)	102.	(3)	103.	(2)	104.	(4)	105.	(3)	106.	(1)	107.	(3)	108.	(2)	109.	(4)	110.	(3)
111.	(3)	112.	(3)	113.	(1)	114.	(2)	115.	(3)	116.	(3)	117.	(1)	118.	(1)	119.	(4)	120.	(4)
121.	(3)	122.	(1)	123.	(3)	124.	(1)	125.	(4)	126.	(4)	127.	(4)	128.	(3)	129.	(1)	130.	(4)
131.	(3)	132.	(4)	133.	(2)	134.	(3)	135.	(4)	136.	(2)	137.	(2)	138.	(2)	139.	(4)	140.	(3)
141.	(2)	142.	(3)	143.	(1)	144.	(4)	145.	(4)	146.	(2)	147.	(3)	148.	(3)	149.	(2)	150.	(2)
151.	(3)	152.	(2)	153.	(3)	154.	(1)	155.	(2)	156.	(4)	157.	(3)	158.	(4)	159.	(4)	160.	(4)
161.	(1)	162.	(1)	163.	(2)	164.	(3)	165.	(4)	166.	(3)	167.	(4)	168.	(3)	169.	(4)	170.	(3)
171.	(2)	172.	(3)	173.	(2)	174.	(1)	175.	(3)	176.	(4)	177.	(3)	178.	(2)	179.	(4)	180.	(3)
181.	(2)	182.	(2)	183.	(3)	184.	(1)	185.	(4)	186.	(1)	187.	(2)	188.	(2)	189.	(1)	190.	(3)
191.	(3)	192.	(1)																

THE TISSUES

1 Consider the given two statements:

Statement I:	Fascicular vascular cambium, interfascicular cambium, and cork-cambium are examples of lateral meristems.
Statement II:	These are responsible for producing secondary tissues.

1. **Statement I** is correct; **Statement II** is correct
2. **Statement I** is incorrect; **Statement II** is correct
3. **Statement I** is correct; **Statement II** is incorrect
4. **Statement I** is incorrect; **Statement II** is incorrect

2 Consider the given two statements:

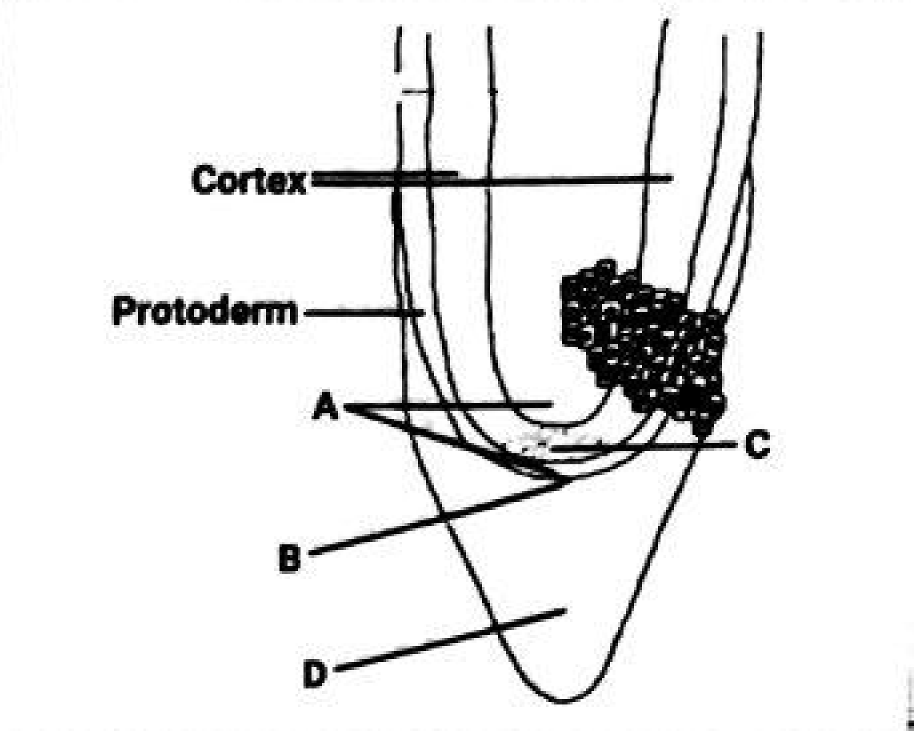
Assertion(A):	Apical meristems and intercalary meristems are primary meristems.
Reason (R):	They appear early in life of a plant and contribute to the formation of the primary plant body.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**
3.	**(A)** is True; **(R)** is False
4.	Both **(A)** and **(R)** are False

3 Which meristem is responsible for the regeneration of parts of grasses removed by the grazing herbivores?

1. Apical meristem
2. Intercalary meristem
3. Interfascicular cambium
4. Fascicular vascular cambium

4 In the given diagram, the root apical meristem is represented by the letter:



1. A
2. B
3. C
4. D

5 The meristem that helps grasses regenerate parts removed by the grazing herbivores is the:

1.	Shoot apical meristem	2.	Root apical meristem
3.	Intercalary meristem	4.	Lateral meristem

6 Axillary bud:

I:	is constituted by some cells 'left behind' from shoot apical meristem during the formation of leaves and elongation of stems.
II:	is present in the axils of leaves and is capable of forming a branch or a flower.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

7 All the following are examples of secondary or lateral meristems except:

1.	Fascicular vascular cambium	2.	Intercalary meristem
3.	Interfascicular meristem	4.	Cork cambium

8 Parenchymatous tissue is involved in:

I:	Photosynthesis
II:	Storage of food materials
III:	Secretion and excretion

1. Only **I** and **II**
2. Only **I** and **III**
3. Only **II** and **III**
4. **I, II** and **III**

9 Consider the given two statements:

Statement I:	Parenchyma cells are loosely packed and have large intercellular spaces.
Statement II:	Collenchyma cells are thin-walled and primarily serve to transport nutrients.

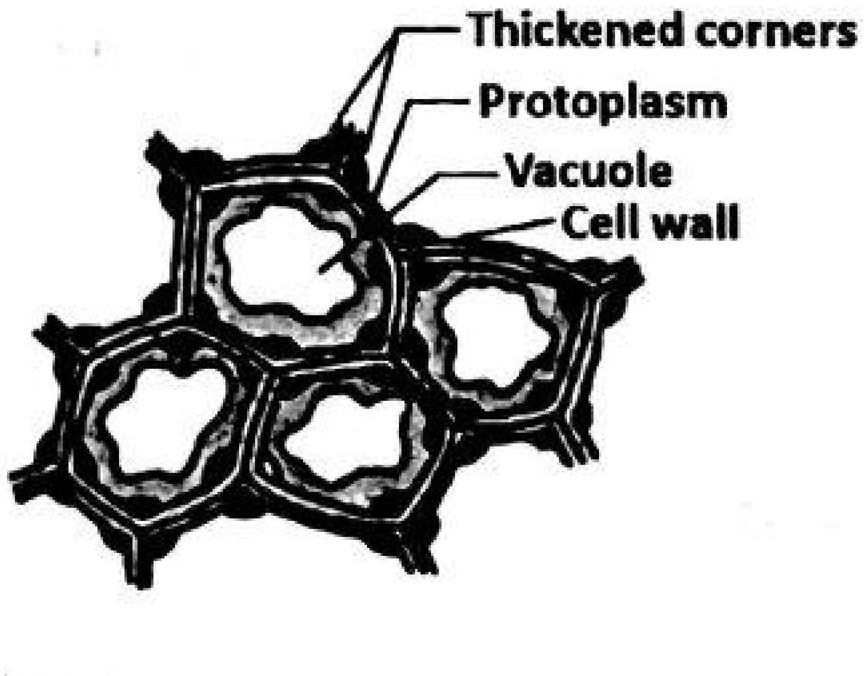
1.	Only **Statement I** is correct.
2.	Only **Statement II** is correct.
3.	Both **Statement I** and **Statement II** are correct.
4.	Both **Statement I** and **Statement II** are incorrect

10 Collenchyma in plants:

I:	occurs in layers below the epidermis in most of the dicotyledonous plants.
II:	consists of cells that are much thickened at the corners due to deposition of cellulose, hemicellulose, and pectin.
III:	never contains chloroplasts.
IV:	provides mechanical support to the growing parts of the plant such as the young stem and petiole of a leaf.

1. Only **I**, **II**, and **III** are correct
2. Only **I**, **II**, and **IV** are correct
3. Only **II**, **III**, and **IV** are correct
4. Only **I**, **III**, and **IV** are correct

11 Name the plant tissue shown in the given figure:



1. Parenchyma
2. Collenchyma
3. Fibres
4. Sclereids

12 Which feature is characteristic of sclerenchyma cells?

1.	They have thin walls and are living at maturity.
2.	They are primarily involved in storage of nutrients.
3.	They have thick, lignified secondary walls and are usually dead at maturity.
4.	They are large, vacuolated, and specialized for conduction.

13 Primary xylem is of two types – protoxylem and metaxylem.

Statement I:	In roots, the protoxylem lies towards the center (pith) and the metaxylem lies towards the periphery of the organ. This type of primary xylem is called endarch.
Statement II:	In stems, the protoxylem lies towards the periphery and the metaxylem lies towards the center. Such an arrangement of the primary xylem is called an exarch.

1. **Statement I** is correct; **Statement II** is correct
2. **Statement I** is incorrect; **Statement II** is correct
3. **Statement I** is correct; **Statement II** is incorrect
4. **Statement I** is incorrect; **Statement II** is incorrect

14

Assertion (A):	Xylem and phloem are not called complex tissues in a plant body.
Reason (R):	They are composed of a single type of cell with similar structures and functions.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	Both **(A)** and **(R)** are True and **(R)** does not correctly explain **(A)**.
3.	**(A)** is True; **(R)** is False
4.	Both **(A)** and **(R)** are False

15 Consider the given two statements:

Assertion (A):	Vessels are particularly advantageous in environments where rapid water transport is needed, such as in tall trees or in plants growing in warm, sunny environments.
Reason (R):	Tracheids are less efficient in conducting water due to their smaller diameter and the absence of large openings (perforations) at their ends.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**
2.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**
3.	**(A)** is True, **(R)** is False
4.	**(A)** is False, **(R)** is True

16 How many of the following statements about plant tissues are correct?

I:	Sclerenchyma cells are typically dead and have thickened lignified walls that help in providing structural support.
II:	Xylem tissues are primarily involved in the storage of proteins and starch.
III:	Phloem tissues are responsible for the transport of water and minerals from the roots to the leaves.
IV:	Parenchyma cells are versatile cells that can store food, and are also involved in photosynthesis and repair.

1. One
2. Two
3. Three
4. Four

17 The development of the root primary xylem is said to be:

1. Exarch
2. Endarch
3. Centrifugal
4. Diffuse

18

Statement I:	Phloem fibers (bast fibers) are made up of sclerenchymatous cells and are absent in the primary phloem but are found in the secondary phloem.
Statement II:	The phloem parenchyma stores food material and other substances like resins, latex, and mucilage and is absent in most of the monocotyledons.

1. **Statement I** is correct; **Statement II** is correct
2. **Statement I** is incorrect; **Statement II** is correct
3. **Statement I** is correct; **Statement II** is incorrect
4. **Statement I** is incorrect; **Statement II** is incorrect

19 Which of the following is missing in sieve tube elements when they attain maturity?

1.	Nuclei	2.	Cytoplasm
3.	P-protein	4.	Callose

20 Consider the two statements.

Statement I:	Gymnosperms lack albuminous cells and sieve cells.
Statement II:	Gymnosperms have sieve tubes and companion cells.

1. Only **Statement I** is correct.
2. Only **Statement II** is correct.
3. Both **Statement I** and **Statement II** are correct.
4. Both **Statement I** and **Statement II** are incorrect.

21 Both sieve tube cells in plants and erythrocytes in humans:

1. lack mitochondria
2. have a non-cellulosic cell wall
3. carry respiratory pigments
4. are characterised by an absence of nucleus

22 Consider the given two statements:

I:	Monocots have companion cells, dicots do not.
II:	Monocots have sieve tubes, while dicots have sieve cells.

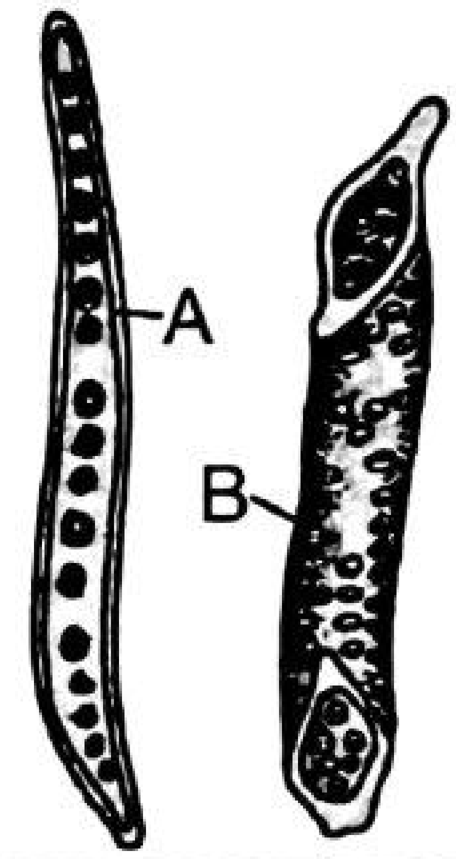
1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

23 Consider the given two statements regarding sclerenchyma:

Statement I:	Sclereids are highly thickened dead cells with very narrow cavities.
Statement II:	Sclereids are commonly found in fruit walls of nuts, seed coat of legumes and leaves of tea.

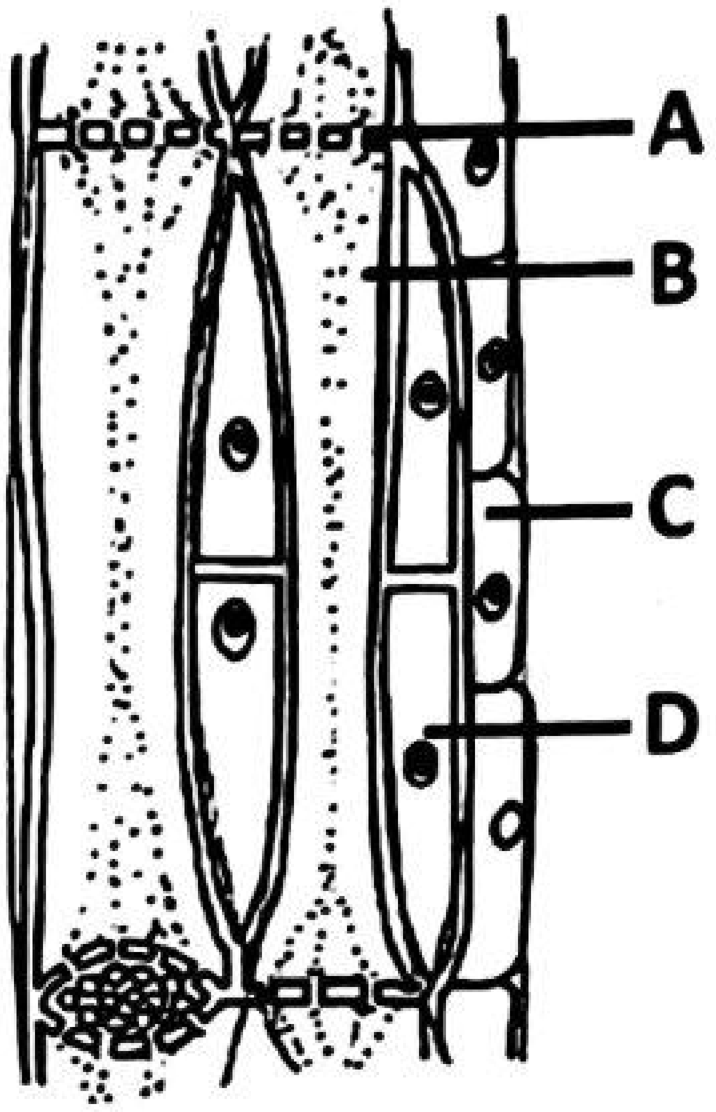
1. **Statement I** is correct; **Statement II** is incorrect
2. **Statement I** is incorrect; **Statement II** is correct
3. **Statement I** is correct; **Statement II** is correct
4. **Statement I** is incorrect; **Statement II** is incorrect

24 Identify A and B in the given diagram:



	A	B
1.	Xylem	Phloem
2.	Phloem	Xylem
3.	Vessel	Tracheid
4.	Tracheid	Vessel

25 Identify A, B, C and D in the given diagram:



	A	B	C	D
1.	Sieve pore	Sieve tube element	Phloem Parenchyma	Companion cell
2.	Sieve tube element	Sieve pore	Phloem Parenchyma	Companion cell
3.	Sieve pore	Sieve tube element	Companion cell	Phloem Parenchyma
4.	Sieve tube element	Sieve pore	Companion cell	Phloem Parenchyma

26 How many of the given statements are correct?

I:	Gymnosperms have albuminous cells and sieve cells but lack sieve tubes and companion cells
II:	The sieve tube elements and companion cells are connected by pit fields present between their common longitudinal walls.
III:	Cell walls of phloem parenchyma cells have pits through which plasmodesmatal connections exist between cells.
IV:	Phloem parenchyma is absent in most of the monocots.
V:	Phloem fibers become dead at maturity.
VI:	Phloem fibers are generally absent in primary phloem.

1. 3
2. 4
3. 5
4. 6

THE TISSUE SYSTEM

27 Identify the tissue system from among the following:

1. Parenchyma	2. Xylem
3. Epidermis	4. Phloem

28 The epidermal tissue system in plants:

I:	forms the outer-most covering of the whole plant body.
II:	comprises epidermal cells, stomata and the epidermal appendages – the trichomes and hairs.
III:	is usually multi-layered.
IV:	has parenchymatous cells without a vacuole.

1. Only I and II are correct
2. Only III and IV are correct
3. Only I and III are correct
4. Only II and IV are correct

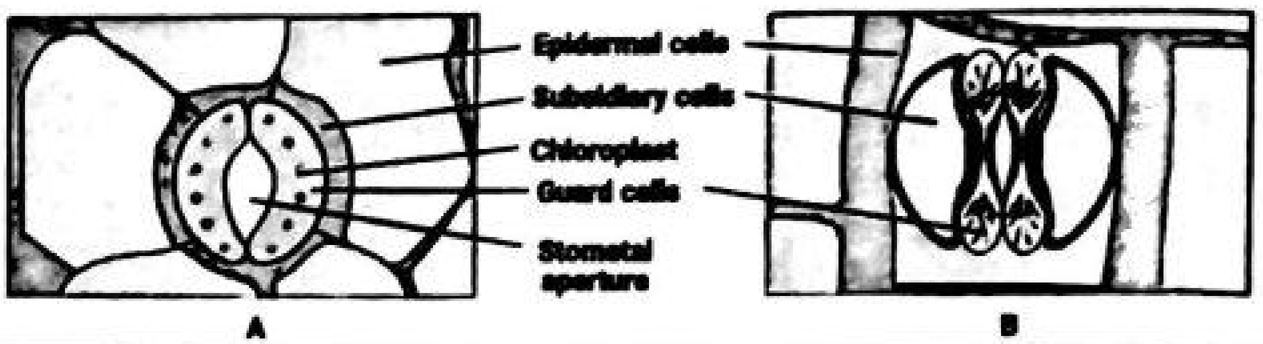
29 The outside of the epidermis in plant body is often covered with a waxy thick layer called the cuticle which:

I: prevents the loss of water.

II: is present in roots.

1. I is correct; II is correct
2. I is incorrect; II is correct
3. I is incorrect; II is incorrect
4. I is correct; II is incorrect

30 What would be true for A and B shown in the given diagram?



1.	A shows open stomatal aperture while B shows closed stomatal aperture
2.	A shows closed stomatal aperture while B shows open stomatal aperture
3.	A shows the stomata in grasses
4.	B shows the stomata in grasses

31 Guard cells:

1. are bean-shaped in grasses
2. have a thin inner and a thick outer wall
3. do not contain chloroplasts
4. regulate the opening and closing of stomata

32 Stomatal apparatus in the epidermal tissue system of plants consists of:

1.	Only stomatal aperture and guard cells but not subsidiary cells.
2.	Only stomatal aperture but not guard cells and subsidiary cells.
3.	Only guard cells and subsidiary cells but not stomatal aperture.
4.	Stomatal aperture, guard cells and subsidiary cells but not other epidermal cells.

33 The primary function of stomata in plant leave is to:

1.	Absorb water from the soil.
2.	Exchange gases with the environment, primarily for photosynthesis and respiration.
3.	Transport nutrients from the roots to other parts of the plant.
4.	Protect against herbivores by secreting defensive compounds

34 Regarding the guard cells:

1.	walls away from the stomatal pores are thin and those towards the stomatal pores are thick
2.	walls away from the stomatal pores are thick and those towards the stomatal pores are thin
3.	chloroplasts are mostly absent
4.	play no role in the regulation of opening and closing of stomata

35 Root hairs are:

1. unicellular extensions of subsidiary cells
2. unicellular elongations of epidermal cells
3. unicellular elongations of ground tissue cells
4. appendages of the cuticle

36 All the following are true for trichomes except:

1.	they are usually unicellular
2.	they may be branched
3.	they may be secretory
4.	they help in prevention of water loss due to transpiration

37 Ground tissue in plant body consists of:

I:	all tissues except epidermis and vascular bundles.
II:	simple tissues such as parenchyma, collenchyma and sclerenchyma.
III:	parenchymatous cells in cortex, pericycle, pith and medullary rays, in the primary stems and roots.
IV:	thin-walled chloroplast containing cells called mesophyll in leaves.

1. Only **I** and **II** are correct
2. Only **III** and **IV** are correct
3. **I, II, III** and **IV** are correct
4. Only **I, III** and **IV** are correct

38 Mesophyll cells present in the ground tissue of leaves are:

1. chloroplasts lacking thin walled cells
2. chloroplasts containing thick walled cells
3. chloroplasts containing thin walled cells
4. chloroplasts lacking thick walled cells

39 Open vascular bundles:

I:	have cambium present between xylem and phloem
II:	possess the ability to form secondary tissues
III:	are rare in dicotyledonous stems

1. Only **I** and **II** are correct
2. Only **I** and **III** are correct
3. Only **II** and **III** are correct
4. **I, II** and **III** are correct

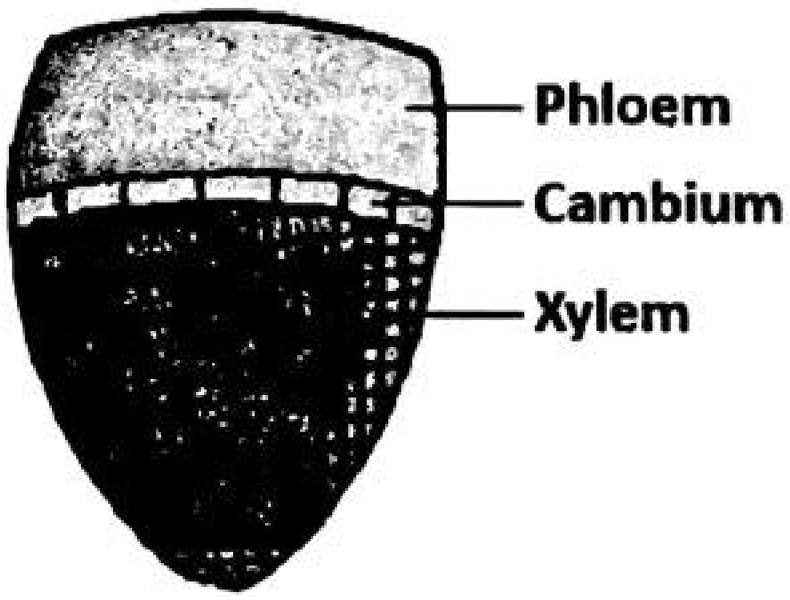
40 In the vascular bundle of a typical monocot such as corn, the structure that is most likely absent will be:

1.	Metaxylem	2.	Cambium
3.	Protoxylem lacuna	4.	Metaphloem

41 Vascular bundles in monocotyledons are considered closed because

1. Cambium is absent
2. There are no vessels with perforations
3. Xylem is surrounded all around by phloem
4. A bundle sheath surrounds each bundle

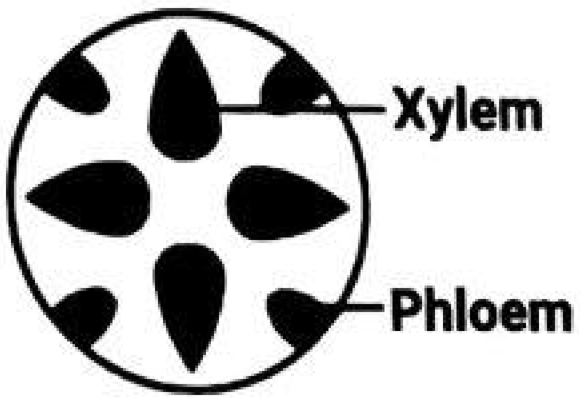
42 The given figure shows:



I: Radial vascular bundles.
II: Open vascular bundles

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

43 The type of vascular bundles shown in the given figure would most likely be seen in:



1.	Dicotyledonous stem	2.	Roots
3.	Monocotyledonous stem	4.	Leaves

44 In conjoint type of vascular bundles:

I:	xylem and phloem are jointly situated on the same radius of vascular bundles.
II:	xylem is usually located on the outer side of the phloem.

1. Only **I** is correct	2. Only **II** is correct
3. Both are correct	4. Both are incorrect

ANATOMY OF DICOTYLEDONOUS AND MONOCOTYLEDONOUS PLANTS

45 All the following statements regarding the anatomy of a typical dicotyledonous root are correct except:

1.	Many cells of the epiblema protrude in the form of unicellular root hairs.
2.	The innermost layer of the cortex is called as the endodermis.
3.	Pericycle is made up of collenchymatous cells.
4.	Parenchymatous conjunctive tissue lies between the xylem and phloem.

46 Epiblema of roots is equivalent to

1.	Pericycle	2.	Endodermis
3.	Epidermis	4.	Stele

47 The term 'stele'in a dicot root does not include:

1.	Endodermis	2.	Pericycle
3.	Vascular bundles	4.	Pith

48 Initiation of lateral roots and vascular cambium during the secondary growth in dicot roots takes place in:

1. Epidermal cells
2. Cortex cells
3. Pericycle
4. Endodermis

49 Regarding endodermis of dicot roots:

I:	It comprises a single layer of pear-shaped cells with well-developed intercellular spaces.
II:	The tangential as well as radial walls of the endodermal cells have a deposition of water-impermeable, waxy material suberin in the form of casparian strips.

1. **I** is correct; **II** is correct
2. **I** is incorrect; **II** is correct
3. **I** is incorrect; **II** is incorrect
4. **I** is correct; **II** is incorrect

50 Casparian strips are:

1.	waxy deposition of suberin on only the tangential walls of the endodermal cells
2.	waxy deposition of suberin on only the radial walls of the endodermal cells
3.	waxy deposition of suberin on both tangential and radial walls of the endodermal cells
4.	waxy deposition of lignin on both tangential and radial walls of the endodermal cells

51 Consider the given two statements:

Assertion (A):	The presence of a casparian strip is characteristic of the endodermis in plant roots.
Reason (R):	The casparian strip is made up of cellulose and pectin which helps in regulating the flow of substances into the vascular tissue.

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	**(A)** is False but **(R)** is True.

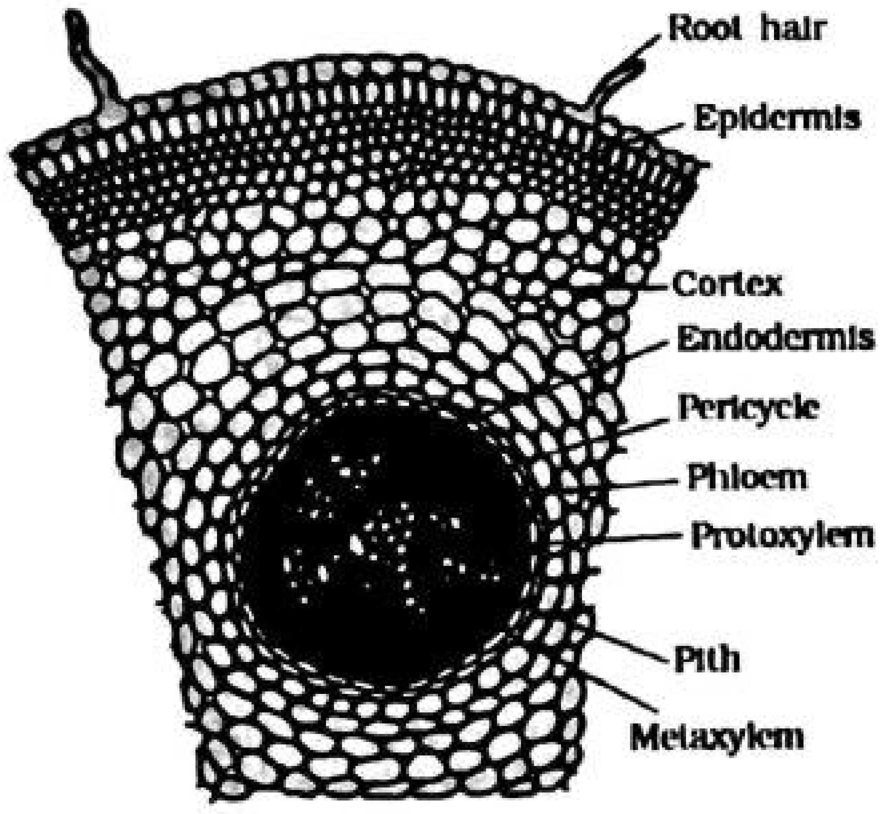
52 As compared to a dicot root, a monocot root has

1. More abundant secondary xylem
2. Many xylem bundles
3. Inconspicuous annual rings
4. Relatively thicker periderm

53 Monocot root anatomy is different from the anatomy of dicot root in all the following aspects except:

1. More developed pith
2. Polyarch vascular bundles
3. Absence of secondary growth
4. Presence of multicellular root hairs

54 What will be true for the figure showing the transverse section of an angiosperm root?



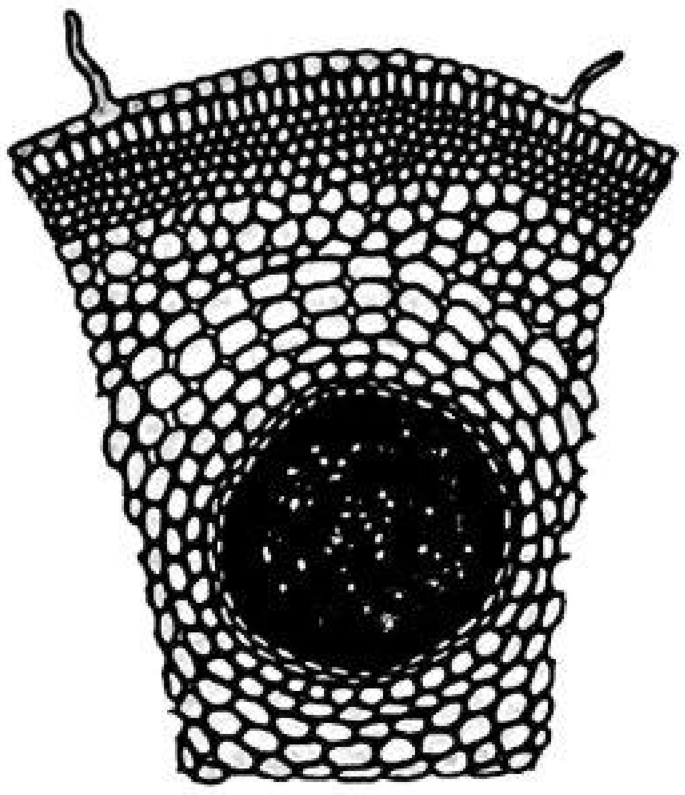
I: It is a section of a dicot root.
II: Secondary growth will be well marked later in this root.
III: The vascular bundles shown are radial and polyarch.

	I	II	III
1.	T	T	T
2.	F	F	F
3.	F	F	T
4.	T	T	F

55 Presence of exarch and polyarch vascular bundles is characteristically seen in:

1.	Monocot stem	2.	Monocot root
3.	Dicot stem	4.	Dicot root

56 The following T.S. shows the structure of a:



1.	Monocot stem	2.	Dicot stem
3.	Monocot root	4.	Dicot root

57 The hypodermis of a dicotyledonous stem:

1.	is parenchymatous and synthesizes and stores food
2.	is collenchymatous and provides mechanical strength to the young stem
3.	is sclerenchymatous and provides mechanical strength to the young stem
4.	is parenchymatous and provides mechanical strength to the young stem

58 In a dicot stem the term 'starch sheath' is used for:

1.	Epidermis with guard cells	2.	Hypodermis
3.	Endodermis	4.	Pericycle

59 In a dicot stem, the pericycle is present on the inner side of the endodermis and:

1.	above the phloem, in form of semi-lunar patches of sclerenchyma
2.	above the xylem, in form of semi-lunar patches of sclerenchyma
3.	above the phloem, in form of semi-lunar patches of collenchyma
4.	above the xylem, in form of semi-lunar patches of collenchyma

60 What given anatomical feature is not correct for a dicot stem?

1.	Hypodermis	Sclerenchymatous
2.	Endodermis	Starch sheath
3.	Medullary rays	Parenchyma cells
4.	Protoxylem	Endarch

61 The ring arrangement of vascular bundles is a characteristic feature of:

1.	Monocot stem	2.	Dicot stem
3.	Monocot root	4.	Dicot root

62 Match each item in Column I with one in Column II and select the best match as your answer from the codes given:

	Column I [Plant part]		Column II [Type of vascular bundle]
A	Monocot root	P	Radial, two to four patches
B	Dicot root	Q	Radial, polyarch
C	Monocot stem	R	Conjoint, open, ring arrangement
D	Dicot stem	S	Conjoint, Closed and scattered

Codes:

	A	B	C	D
1.	P	Q	R	S
2.	Q	P	R	S
3.	Q	P	S	R
4.	P	Q	S	R

63 In dicot stems, each vascular bundle is:

1. conjoint, open, and with endarch protoxylem.
2. conjoint, closed, and with endarch protoxylem.
3. radial, open, and with endarch protoxylem.
4. conjoint, open, and with exarch protoxylem.

64 In the transverse section of a dicot stem, the correct chronological order of the appearance of the following structures [from epidermis towards pith] will be:

1.	Hypodermis – Pericycle – Endodermis – Vascular bundles
2.	Vascular bundles – Pericycle – Endodermis – Hypodermis
3.	Hypodermis – Endodermis – Pericycle – Vascular bundles
4.	Vascular bundles – Endodermis – Pericycle – Hypodermis

65 Consider the given two statements:

Statement I:	In roots, the protoxylem lies towards the centre (pith) and the metaxylem lies towards the periphery of the organ.
Statement II:	In stems, the protoxylem lies towards periphery and metaxylem lies towards the centre.

1. **Statement I** is incorrect; **Statement II** is incorrect
2. **Statement I** is correct; **Statement II** is correct
3. **Statement I** is incorrect; **Statement II** is correct
4. **Statement I** is correct; **Statement II** is incorrect

66 Match each item in Column I with one in Column II and select the correct match from the codes given:

	Column I		Column II
A.	Dicot stem	P.	Vascular bundles are arranged in a ring
B.	Monocot stem	Q.	Pith is small or inconspicuous
C.	Dicot root	R.	Vascular bundles are many and scattered in the ground tissue with no definite arrangement.
D.	Monocot root	S.	Pith is large and well developed

Codes:

	A	B	C	D
1.	Q	S	P	R
2.	S	Q	R	P
3.	P	R	Q	S
4.	R	P	S	Q

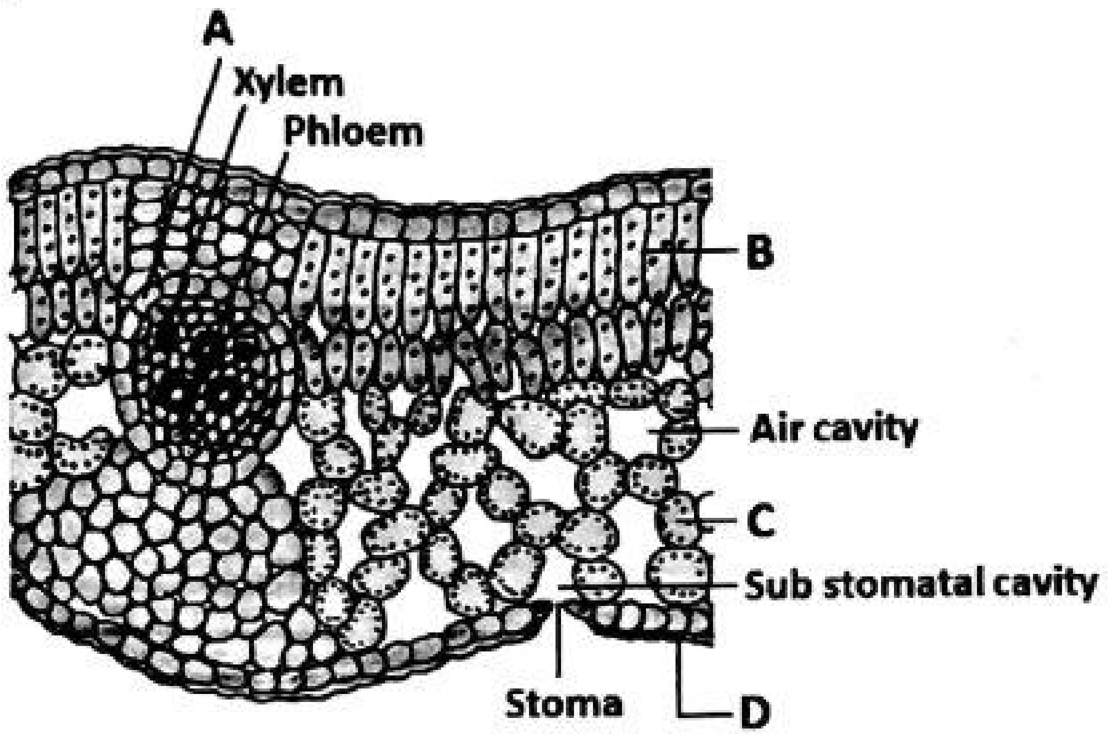
67 In a monocot stem:

1.	Each vascular bundle is surrounded by a sclerenchymatous bundle sheath
2.	Ground tissue is very poorly developed
3.	Vascular bundles are conjoint and open with water containing cavities
4.	Phloem parenchyma is present

68 Identify the incorrect matching with respect to anatomy of dicot and monocot leaves?

	Character	Dicot[Dorsiventral]	Monocot [Isobilateral]
1.	Presence of stomata	More on adaxial epidermis	More on abaxial epidermis
2.	Mesophyll	Differentiated into palisade and spongy parenchyma	Not differentiated into palisade and spongy parenchyma
3.	Venation	Mostly reticulate	Mostly parallel
4.	Size of vascular bundle	Dependent on the size of veins	Near similar size except in main veins

69 Identify A, B, C and D in the given figure:



	A	B	C	D
1.	Bundle sheath cells	Palisade mesophyll	Spongy mesophyll	Abaxial epidermis
2.	Bundle sheath cells	Palisade mesophyll	Spongy mesophyll	Adaxial epidermis
3.	Spongy mesophyll	Bundle sheath cells	Palisade mesophyll	Abaxial epidermis
4.	Palisade mesophyll	Spongy mesophyll	Bundle sheath cells	Adaxial epidermis

70 In Dorsiventral (Dicotyledonous) Leaf:

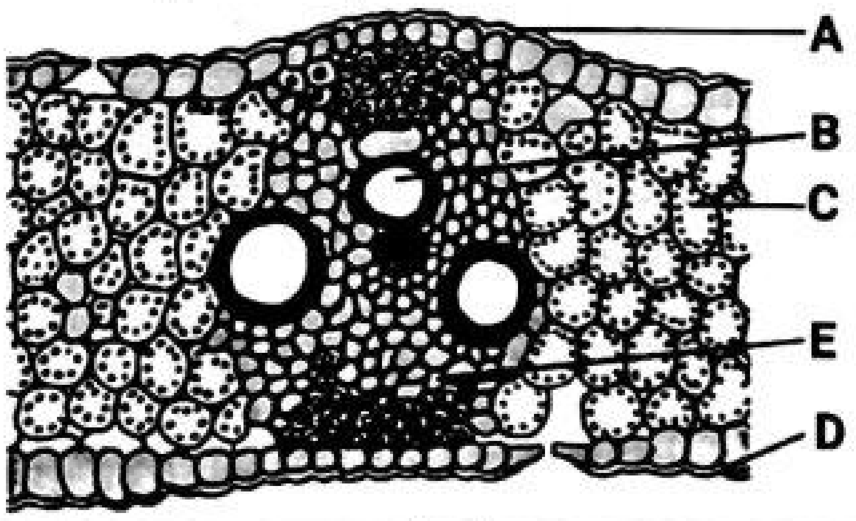
1.	The adaxially placed palisade parenchyma is made up of elongated cells, which are arranged vertically and parallel to each other.
2.	The abaxially placed palisade parenchyma is made up of elongated cells, which are arranged vertically and parallel to each other.
3.	The adaxially placed palisade parenchyma is made up of oval or round and loosely arranged spongy parenchyma and extends to the lower epidermis.
4.	The abaxially placed palisade parenchyma is made up of oval or round and loosely arranged spongy parenchyma and extends to the lower epidermis.

71 In Dorsiventral (Dicotyledonous) Leaf:

I:	The adaxial epidermis generally bears more stomata than the abaxial epidermis.
II:	Mesophyll has two types of cells – the palisade parenchyma and the spongy parenchyma.

1. **I** is correct; **II** is correct
2. **I** is incorrect; **II** is correct
3. **I** is incorrect; **II** is incorrect
4. **I** is correct; **II** is incorrect

72 A diagram of the transverse section of a monocot leaf is given below with certain parts indicated as letters of the alphabet. Select the option which incorrectly matches the alphabet with the part it represents:



1.	A - Adaxial epidermis	2.	B - Phloem
3.	C - Mesophyll	4.	D - Abaxial epidermis

73 The parallel venation in monocot leaves is reflected in the:

1.	wide variations in size of vascular bundles in the main veins
2.	wide variations in size of vascular bundles except in the main veins
3.	near similar size of vascular bundles in the main veins
4.	near similar size of vascular bundles except in the main veins

74 In an isobilateral leaf:

I:	the stomata are present on both the surfaces of the epidermis
II:	the mesophyll is not differentiated into palisade and spongy parenchyma

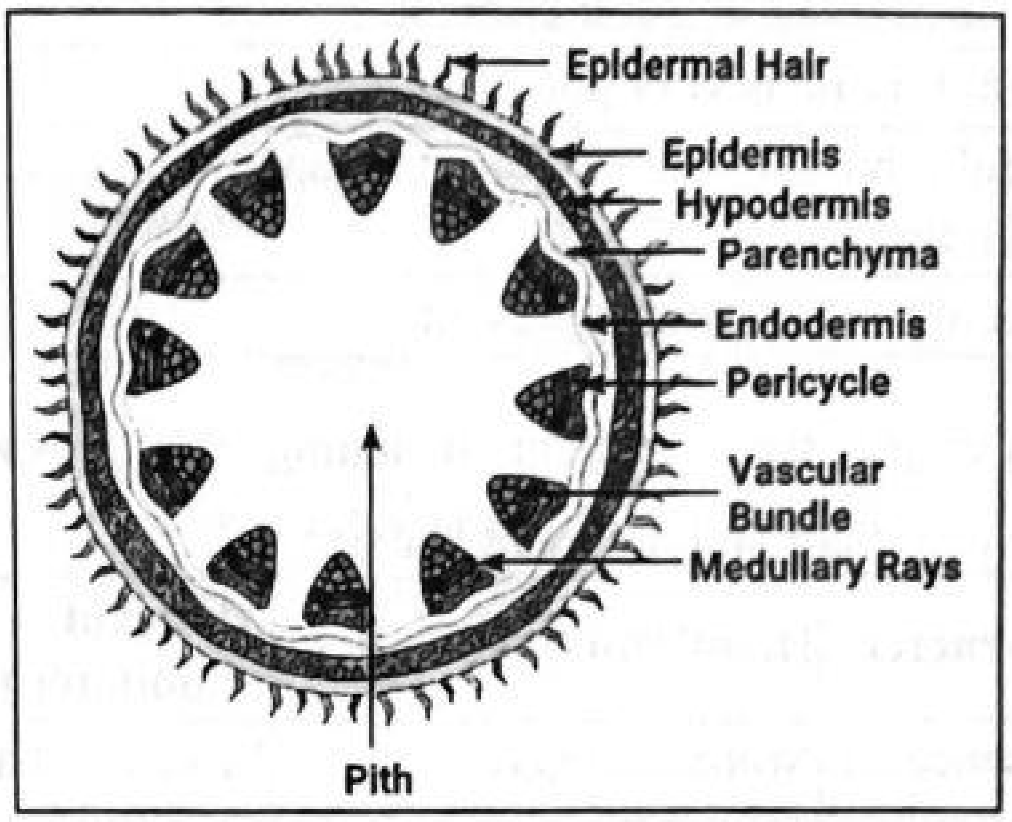
1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

75 In Isobilateral (Monocotyledonous) Leaf:

I:	The stomata are present on both the surfaces of the epidermis.
II:	The mesophyll is not differentiated into palisade and spongy parenchyma.
III:	The parallel venation in monocot leaves is reflected in the near similar sizes of vascular bundles (except in main veins) as seen in vertical sections of the leaves.

1. Only **I** and **II** are correct
2. Only **II** and **III** are correct
3. **I**, **II** and **III** are correct
4. Only **III** is correct

76 The following TS shows the structure of a:



1.	Monocot stem	2.	Dicot stem
3.	Monocot root	4.	Dicot root

77

Statement I:	In grasses, certain adaxial epidermal cells along the veins modify themselves into large, empty, colourless bulliform cells.
Statement II:	When the bulliform cells in the leaves have absorbed water and are turgid, the leaf surface is exposed.

1.	**Statement I** is correct; **Statement II** is correct
2.	**Statement I** is correct; **Statement II** is incorrect
3.	**Statement I** is incorrect; **Statement II** is correct
4.	**Statement I** is incorrect; **Statement II** is incorrect

ANATOMY OF FLOWERING PLANTS - ANSWER KEY

1.	(1)	2.	(1)	3.	(2)	4.	(3)	5.	(3)	6.	(3)	7.	(2)	8.	(4)	9.	(4)	10.	(2)
11.	(2)	12.	(3)	13.	(4)	14.	(4)	15.	(2)	16.	(2)	17.	(1)	18.	(1)	19.	(1)	20.	(4)
21.	(4)	22.	(4)	23.	(3)	24.	(2)	25.	(1)	26.	(4)	27.	(3)	28.	(1)	29.	(4)	30.	(4)
31.	(4)	32.	(4)	33.	(2)	34.	(1)	35.	(2)	36.	(1)	37.	(3)	38.	(3)	39.	(1)	40.	(2)
41.	(1)	42.	(2)	43.	(2)	44.	(1)	45.	(3)	46.	(3)	47.	(1)	48.	(3)	49.	(2)	50.	(3)
51.	(3)	52.	(2)	53.	(4)	54.	(3)	55.	(2)	56.	(3)	57.	(2)	58.	(3)	59.	(1)	60.	(1)
61.	(2)	62.	(3)	63.	(1)	64.	(3)	65.	(1)	66.	(3)	67.	(1)	68.	(1)	69.	(1)	70.	(1)
71.	(2)	72.	(2)	73.	(4)	74.	(3)	75.	(3)	76.	(2)	77.	(1)						

THE ROOT

1 Consider the given statements:

I:	In majority of the dicotyledonous plants, the direct elongation of the radicle leads to the formation of primary root which grows inside the soil.
II:	It bears lateral roots of several orders that are referred to as secondary, tertiary, etc., roots.
III:	The primary roots and its branches constitute the tap root system, as seen in the mustard plant.

1. Only **I** and **II** are correct
2. Only **I** and **III** are correct
3. Only **II** and **III** are correct
4. **I, II** and **III** are correct

2 Although a root system performs many functions, a fibrous root system may especially be excellent for:

1. storage of food
2. absorbing water from the deeper layers of soil
3. nitrogen fixation
4. providing good anchorage to the plant

3 How many of the given statements are true?

I:	The primary roots and its branches constitute the tap root system, as seen in the mustard plant.
II:	Fibrous root system is seen in the wheat plant.
III:	Adventitious roots are seen in Monstera and the banyan tree

1. 0
2. 1
3. 2
4. 3

4 Which statement accurately describes tap roots and fibrous roots?

1.	Tap roots are the main roots from which other roots sprout laterally, while fibrous roots have no main root but many branching roots.
2.	Fibrous roots grow deep into the soil, while tap roots spread out near the soil surface.
3.	Tap roots are found in monocots, while fibrous roots are found in dicots.
4.	Fibrous roots store food, whereas tap roots do not store food.

5 Regarding regions of roots in angiosperms

I:	the apex is covered by a thimble-like structure called the root cap
II:	cells of the region of meristematic activity divide repeatedly
III:	Root hairs are found in the region of elongation

1. Only **I** and **II** are correct
2. Only **I** and **III** are correct
3. Only **II** and **III** are correct
4. **I, II**, and **III** are correct

6 What is the correct sequence of regions at a root tip?

1.	Root cap, zone of elongation, zone of maturation, meristematic zone
2.	Meristematic zone, zone of elongation, zone of maturation, root cap
3.	Root cap, meristematic zone, zone of elongation, zone of maturation
4.	Zone of maturation, zone of elongation, root cap, meristematic zone

7 Identify the correct statement:

1.	Monocotyledonous plants generally have taproot systems with one or more primary and secondary roots.
2.	The root hair zone develops in the region of elongation.
3.	Roots that develop from a stem, leaf, or other plant part are called adventitious roots.
4.	Apical meristem is found in the region of maturation.

8 Regarding the regions of the root tip:

I.	Root cap protects the tender apex of the root
II.	Region of elongation is proximal to region of meristematic activity
III.	Region of maturation has root hairs

1. Only **I** and **II** are correct
2. Only **I** and **III** are correct
3. Only **II** and **III** are correct
4. **I, II** and **III** are correct

9 Roots are modified in some plants for storing reserve food materials. These modified roots usually are swollen and assume different forms. Which of the following such roots does not have any definite shape?

1. radish
2. beet
3. carrot
4. sweet potato

10 Roots are modified to provide mechanical support as seen in:

I:	prop roots of banyan
II:	stilt roots of maize
III:	betel/black where nodes and internodes bear roots that help in climbing

1. Only **I** and **II** are correct
2. Only **I** and **III** are correct
3. Only **II** and **III** are correct
4. **I, II,** and **III** are correct

11 Identify the correctly matched pair:

1. Sugarcane - Prop roots
2. Banyan - Stilt roots
3. Maize - Stilt roots
4. Mangrove - Prop roots

12

Assertion (A):	Pneumatophores are critical for the survival of certain mangrove species, including *Rhizophora.*
Reason (R):	Mangrove plants live in unique habitat, which is characterized by waterlogged and often anoxic soil conditions and pneumatophores help in respiration under such conditions.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	Both **(A)** and **(R)** are True and **(R)** does not correctly explain **(A)**.
3.	**(A)** is True; **(R)** is False
4.	Both **(A)** and **(R)** are False

13 In swampy areas like the Sunderbans in West Bengal, plants bear special kind of roots called

1.	Prop roots	2.	Tuberous roots
3.	Pneumatophores	4.	Moniliform roots

THE STEM

14 What are the features that distinguish a stem from a root?

	Stem	Root
I:	Develops from plumule of germinating seed	Develops from radicle of germinating seed
II:	Bears nodes and internodes	Bears nodes but not internodes
III:	Does not bear buds	Bears buds, which may be terminal or axillary

1. Only **I**
2. Only **II** and **III**
3. Only **I** and **III**
4. Only **I** and **II**

15 What is not true for a stem in a flowering plant in general?

1.	Negatively geotropic
2.	Develops from plumule of the germinating embryo
3.	Absence of terminal and axillary buds
4.	Spreads out branches bearing leaves, flowers and fruits

16 Stem tendrils are not seen in:

1.	Grapevine	2.	Watermelon
3.	Citrus	4.	Cucumber

17 How many of the given statements are true?

I:	Stem tendrils are seen in in gourds and grapevines.
II:	Axillary buds get modified into thorns in Citrus.
III:	Stems are modified into flattened structures in Opuntia.

1. 0
2. 1
3. 2
4. 3

18 Identify the correct statement regarding the stem morphology from the following:

I:	Axillary buds may get modified into thorns as in gourds.
II:	Stem tendrils develop from axillary buds as in Citrus.

1. Only **I**
2. Only **II**
3. Both **I** and **II**
4. Neither **I** nor **II**

19 Stem is modified into a fleshy cylindrical structure in:

1.	*Euphorbia*	2.	*Pistia*
3.	*Citrus*	4.	*Bougainvillea*

20 The lateral branches originate from the basal and underground portion of the main stem, grow horizontally beneath the soil, and then come out obliquely upward giving rise to leafy shoots in

1. Pistia and Eichhornia
2. Pineapple and Chrysanthemum
3. Mint and Jasmine
4. Opuntia and Euphorbia

21 Runner, a stem modification for vegetative propagation, is found in all of the following except:

1. Cyanodon dactylon
2. Oxalis
3. Pistia
4. Marsilea

22 Identify the incorrectly matched pair:

	Sub-aerial modification of stem	Example
1.	Runner	*Oxalis*
2.	Stolon	Peppermint
3.	Offset	*Pistia*
4.	Sucker	*Eicchornia*

23 A lateral branch with short internodes and each node bearing a rosette of leaves and a tuft of roots is found in:

1. *Chrysanthemum*
2. *Pistia*
3. Jasmine
4. Pineapple

THE LEAF

24 The leaves:

I:	develop at the node, bear buds in their axil that later develop into a branches.
II:	originate from shoot apical meristems and are arranged in an acropetal order.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

25 A bud is present in the axil of:

I:	petiole in simple leaves
II:	petiole in compound leaves
III:	leaflets of the compound leaves

1. Only **I** and **II**	2. Only **I** and **III**
3. Only **II** and **III**	4. **I, II** and **III**

26 Identify the incorrectly matched pair:

1.	Stipules	Small leaf like structure, generally two in number, that are sometimes present at the leaf base
2.	Pulvinus	Leaf base in monocotyledons expanded into a sheath covering the stem partially or wholly
3.	Petiole	A stalk that connects the blade with the leaf base
4.	Leaf blade	Also called as lamina and is the green expanded part of the leaf with veins and veinlets

27 What is the name given to the swollen leaf base found in some legumes?

1. Pulvinus
2. Lamina
3. Ligule
4. Stipule

28 A parallel venation will be seen in the leaves of all the following plants except:

1.	Wheat	2.	Rice
3.	Pea	4.	Maize

29 Match each item in COLUMN I with one in COLUMN II and select the correct match from the codes given:

	Column I		Column II
A.	Simple leaf	P.	Lamina is entire or when incised, the incisions do not touch the midribs
B.	Pinnately compound leaf	Q.	The leaflets are attached at a common point, i.e., at the tip of petiole
C.	Palmately compound leaf	R.	A number of leaflets are present on a common axis, the rachis

Codes:

	A	B	C
1.	P	Q	R
2.	P	R	Q
3.	R	Q	P
4.	Q	P	R

30 Consider the given two statements:

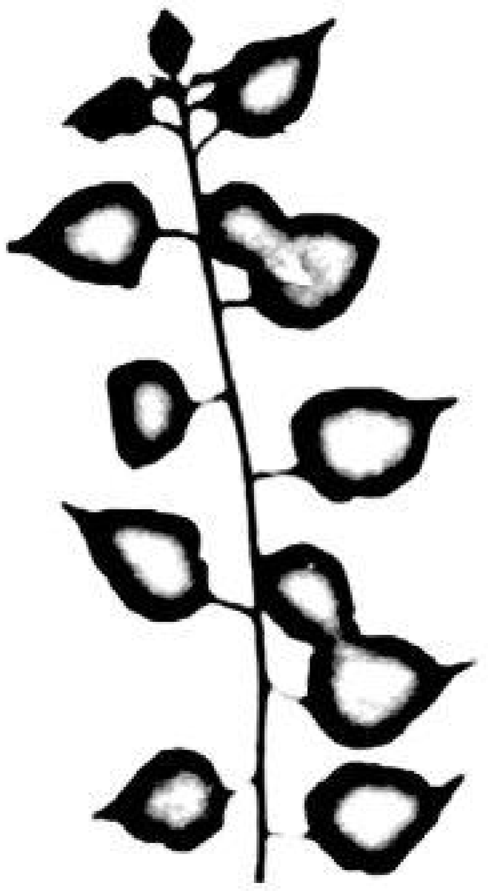
Statement I:	In a pinnately compound leaf, several leaflets are present on a common axis, the rachis, which represents the midrib of the leaf as in neem.
Statement II:	In palmately compound leaves, the leaflets are attached at a common point, i.e., at the tip of the petiole, as in silk cotton.

1.	**Statement I** is correct; **Statement II** is correct
2.	**Statement I** is incorrect; **Statement II** is correct
3.	**Statement I** is correct; **Statement II** is incorrect
4.	**Statement I** is incorrect; **Statement II** is incorrect

31 In silk cotton:

1.	leaves are palmately compound and the leaflets are attached at a common point, i.e., at the tip of the petiole.
2.	leaves are pinnately compound and a number of leaflets are present on a common axis.
3.	leaves are pinnately compound and the leaflets are attached at a common point, i.e., at the tip of the petiole.
4.	leaves are palmately compound and a number of leaflets are present on a common axis.

32 The phyllotaxy shown in the given figure is seen in:



1. Alstonia
2. Calotropis
3. China rose
4. Guava

33 Phyllotaxy is:

1. the arrangement of leaves on a stem.
2. the arrangement of leaflets in a compound leaf.
3. the study of leaf anatomy.
4. the study of plant taxonomy.

34 How many of the given statements are true?

A:	Alternate phyllotaxy is seen in China Rose, Mustard, and Sunflower.
B:	Opposite phyllotaxy is seen in Calotropis and Guava.
C:	Whorled phyllotaxy is seen in Alstonia.

Mark the correct option:

1.	0	2.	1
3.	2	4.	3

35 Petioles help in:

I:	holding the leaf blade to light.
II:	cooling the leaf.
III:	bringing fresh air to leaf surface.

1. Only **I** is correct
2. Only **II** and **III** are correct
3. **I, II** and **III** are correct
4. **I, II** and **III** are incorrect

36 How many of the given pairs are correctly matched?

I: Alternate phyllotaxy: Mustard
II: Leaf tendril: Cacti
III: Leaf spine: Pea

1. 0
2. 1
3. 2
4. 3

37 Which of the following is a leaf modification for protection?

1.	Tendrils	2.	Succulent leaves
3.	Bulbs	4.	Spines

38 How many of the given pairs are correctly matched?

	Leaf modification for	Example
A:	Protection	Argemone
B:	Mechanical support	Pea
C:	Storage of food	Onion
D:	Trapping insects	Nepenthes

1. 1
2. 2
3. 3
4. 4

39 Petiole expands, becomes green and synthesizes food in:

1. *Opuntia*
2. *Euphorbia*
3. *Australian acacia*
4. *Colocasia*

INFLORESCENCE

40 In racemose type of inflorescences:

I:	the main axis continues to grow.
II:	the flowers are borne laterally in an acropetal succession.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are incorrect
4. Both **I** and **II** are correct

41 Study the Assertion statement followed by the Reason statement given below:

Assertion (A):	In cymose type of inflorescence, the growth of the main axis is limited.
Reason (R):	In cymose type of inflorescence, the main axis terminates in a flower.

1.	**(A)** is True but **(R)** is False.
2.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
3.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
4.	**(A)** is False but **(R)** is True.

42 In an inflorescence where flowers are borne laterally in an acropetal succession, the position of the youngest floral bud in the floral axis shall be:

1. at the apex or the topmost point of the inflorescence
2. at the base or the bottom of the inflorescence
3. intercalary
4. anywhere

43 Which statement correctly differentiates cymose from racemose inflorescence?

1.	In cymose inflorescence, the main axis continues to grow, while in racemose, the growth is limited.
2.	Racemose inflorescence has flowers with a pedicel, whereas cymose often does not.
3.	In racemose inflorescence, the oldest flowers are at the top, unlike in cymose, where they are at the bottom.
4.	racemose inflorescence exhibits indefinite growth, while cymose shows definite growth.

44 Identify the correct statements amongst the following:

I:	When a shoot tip transforms into a flower, it is always solitary
II:	In racemose inflorescence, the main axis continues to grow and flowers are borne in basipetal order
III:	In cymose inflorescence, the main axis terminates in a flower and flowers are borne in basipetal order

1.	Only **I**	2.	Only **I** and **II**
3.	Only **I** and **III**	4.	Only **II** and **III**

THE FLOWER

45 What would be the arrangement of floral whorls on the thalamus of a complete flower beginning from the innermost:

1. Calyx, corolla, androecium and gynoecium
2. Calyx, corolla, gynoecium and androecium
3. Gynoecium, androecium, corolla and calyx
4. Androecium, gynoecium, corolla and calyx

46 Consider the two statements:

Statement I:	When a flower has both androecium and gynoecium, it is dioecious.
Statement II:	Androecium and gynoecium are accessory organs of a flower.

1.	Only **Statement I** is correct
2.	Only **Statement II** is correct
3.	Both **Statement I** and **Statement II** are correct
4.	Both **Statement I** and **Statement II** are incorrect

47 Symmetry in flowers is considered actinomorphic when:

1.	They can be divided into two equal halves in any plane.
2.	They can only be divided into two equal halves in one specific plane.
3.	They do not show any symmetry.
4.	They change symmetry at different stages of growth.

48 Zygomorphic flower is not found in:

1. *Cassia*
2. Canna
3. Gulmohur
4. Bean

49 Match each item in Column I with one in Column II and select the correct match from the codes given:

	Column I		Column II
A	Actinomorphic flower	P	*Cassia*
B	Zygomorphic flower	Q	*Datura*
C	Asymmetrical flower	R	*Canna*

Codes:

	A	B	C
1.	P	Q	R
2.	Q	P	R
3.	Q	R	P
4.	P	R	Q

50 How many of the given pairs are correctly matched?

A:	Actinomorphic flower	Pea
B:	Zygomorphic flower	Mustard
C:	Asymmetric flower	Canna

1. 0
2. 1
3. 2
4. 3

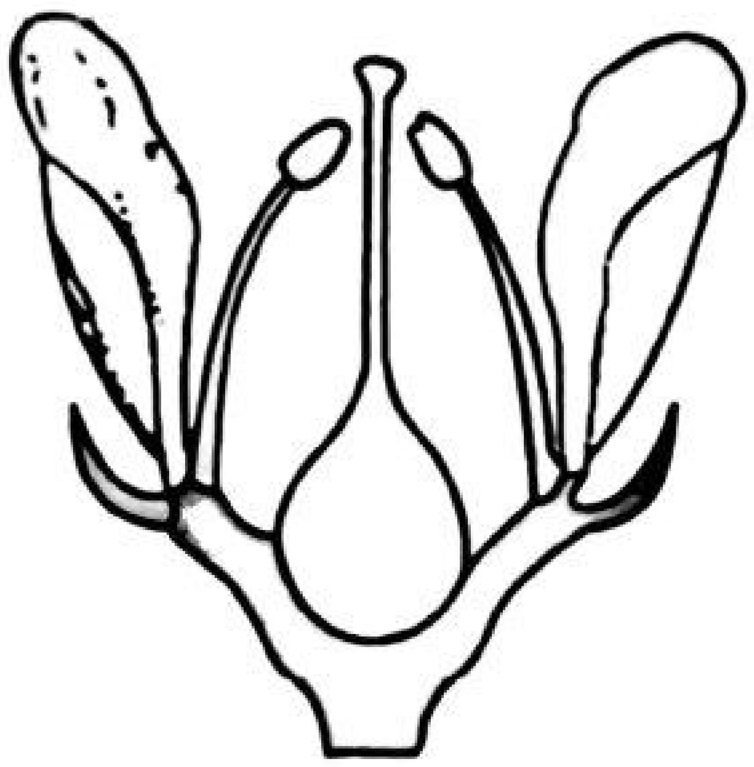
51 In a flower, if the gynoecium occupies the highest position, the flower is said to be:

1.	Superior	2.	Inferior
3.	Hypogynous	4.	Epigynous

52 The ovary is superior and the flower is hypogynous in:

1. Guava
2. Brinjal
3. Cucumber
4. Ray florets of sunflower

53 The given diagram describes:



1. a hypogynous flower with superior ovary
2. an epigynous flower with inferior ovary
3. a perigynous flower with half-inferior ovary
4. a hypogynous flower with inferior ovary

54 Consider the given statements:

I:	In flowers of guava and cucumber, the flower is epigynous and the ovary is inferior
II:	In flowers of mustard, the flower is hypogynous and the ovary is superior

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

55 Match each item in Column I with the one given in Column II and select the correct match from the codes given:

	Column I [Position of Ovary]		**Column II [Type of flower]**
A.	Inferior	P.	Hypogynous
B.	Half inferior	Q.	Perigynous
C.	Superior	R.	Epigynous

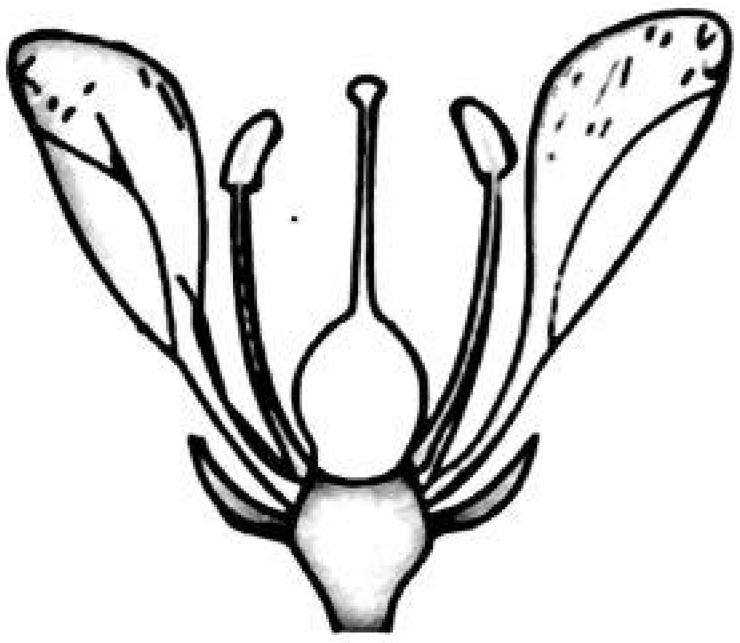
Codes:

	A	B	C
1.	P	Q	R
2.	P	R	Q
3.	R	Q	P
4.	R	P	Q

56 Epigynous flower is seen in:

1.	China rose	2.	Brinjal
3.	Mustard	4.	Ray florets of sunflower

57 Study the given figure and select the correct statements:



Statement I:	The flower is epigynous
Statement II:	Such a flower is seen in rose, plum and peach
Statement III:	The position of ovary will be described as superior

1.	**Statement I** is correct; **Statement II** is incorrect; **Statement III** is correct
2.	**Statement I** is incorrect; **Statement II** is correct; **Statement III** is correct
3.	**Statement I** is correct; **Statement II** is correct; **Statement III** is incorrect
4.	**Statement I** is incorrect; **Statement II** is incorrect; **Statement III** is correct

58 The ovary is said to be half inferior and the flower is called perigynous in all of the following plants except:

1.	Rose	2.	Plum
3.	Peach	4.	China rose

59 The term that describes united sepals in a flower is:

1.	Calyx	2.	Perianth
3.	Gamosepalous	4.	Polysepalous

60 Which of the following refer to individual components of a floral whorl?

i. Androecium

ii. Carpel

iii. Corolla

iv. Sepal

1. i and iv
2. iii and iv
3. ii and iv
4. i and ii

61 When sepals or petals in a whorl just touch one another at the margin, without overlapping, the aestivation is said to be:

1.	Valvate	2.	Twisted
3.	Imbricate	4.	Vexillary

62 Imbricate aestivation of floral parts is seen in:

1.	*Calotropis*	2.	*Cassia*
3.	China rose	4.	Lady's finger

63 In papilionaceous aestivation:

1. standard overlaps the wings that overlap the keel
2. standard overlaps the keel that overlaps the wings
3. wings overlap the standard that overlaps the keel
4. keel overlaps the wings that overlap the standard

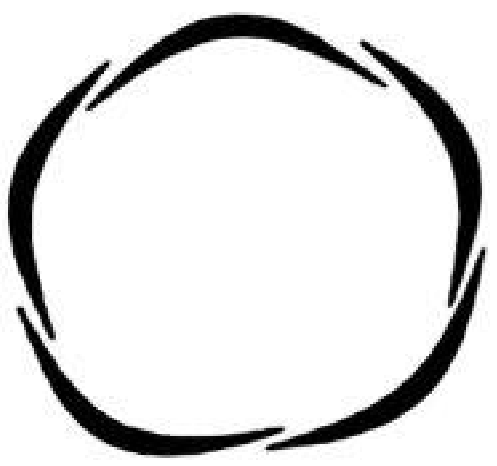
64 Match each item in Column I with one in Column II and select the correct match from the codes given:

	Column I [Aestivation type]		**Column II [Example]**
A.	Valvate	P.	Lady's finger
B.	Twisted	Q.	Bean
C.	Imbricate	R.	Calotropis
D.	Vexillary	S.	Cassia

Codes:

	A	B	C	D
1.	P	R	Q	S
2.	R	P	Q	S
3.	R	P	S	Q
4.	P	R	S	Q

65 The type of aestivation seen in the given figure is:



I: called valvate.

II: seen in Cassia and gulmohur.

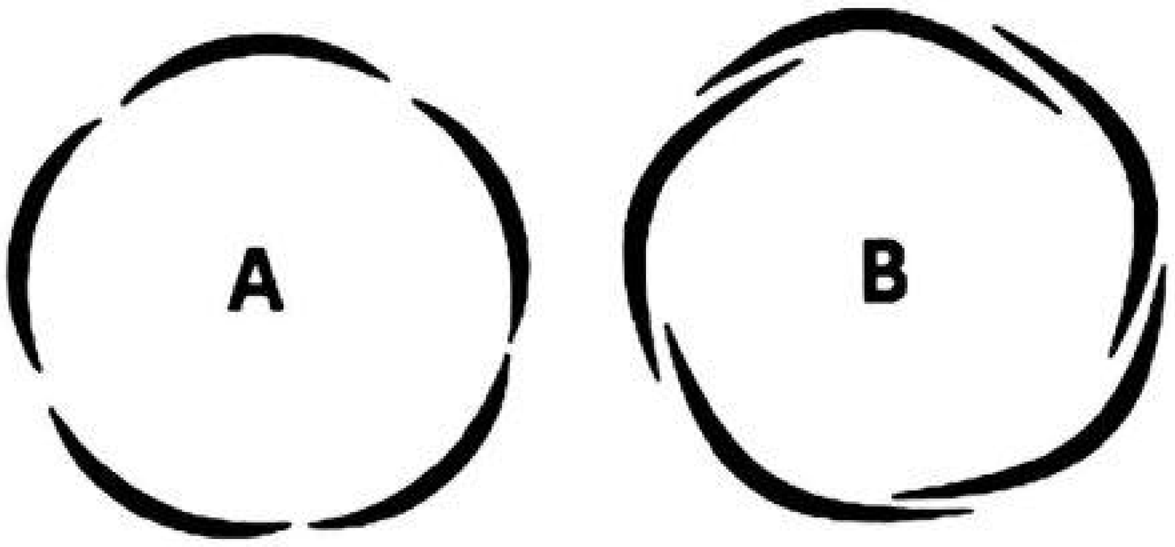
1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

66 In pea and bean flowers, there are five petals, the largest (A) overlaps the two lateral petals (B) which in turn overlap the two smallest anterior petals (C); this type of aestivation is known as (D).

	A	B	C	D
1.	Glume	Wings	Keel	valvate
2.	Standard	Wings	Keel	Valvate
3.	Standard	Keel	Wings	Vexillary
4.	Standard	Wings	Keel	Vexillary

MORPHOLOGY OF FLOWERING PLANTS

67 Regarding the aestivations shown in the given figure:



I:	A is seen in Calotropis.
II:	B is seen in Pea.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

68 Match the following types of corolla aestivation with their descriptions:

	Column I		Column II
A	Valvate	P	Petals just touching each other
B	Imbricate	Q	One petal covering another, the next one is covered by another and so on
C	Twisted	R	One margin of a petal overlaps that of the next one and so on
D	Vexillary	S	Large petal covers smaller petals, which are not overlapping

Codes:

	A	B	C	D
1.	P	Q	R	S
2.	Q	P	S	R
3.	S	P	R	Q
4.	Q	S	R	P

69 Aestivation is:

1.	mode of arrangement of sepals but not petals in a floral bud with respect to the other members of the same whorl
2.	mode of arrangement of petals but not sepals in a floral bud with respect to the other members of the same whorl
3.	mode of arrangement of sepals but not petals in a floral bud with respect to each other
4.	mode of arrangement of sepals or petals in a floral bud with respect to the other members of the same whorl

70 Study the Assertion statement followed by the Reason statement given below:

Assertion (A):	A flower with staminode is best suited for pollinating the pistil in artificial hybridisation experiments in angiosperms.
Reason (R):	Flowers with staminodes are unisexual and produce a large number of pollens.

1.	Both **(A)** and **(R)** are False.
2.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
3.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
4.	**(A)** is False but **(R)** is True.

71 Stamens attached to the perianth as in the flowers of lily are called as:

1.	Epipetalous	2.	Epiphyllous
3.	Polypetalous	4.	Gamopetalous

72 How many of the given statements are true?

A:	When stamens are attached to the petals, they are epipetalous as in brinjal
B:	When stamens are attached to the perianth, they are epiphyllous as in lily
C:	The stamens may be united into one bunch or one bundle (monadelphous) as in China rose
D:	There may be a variation in the length of filaments within a flower, as in Salvia and mustard

1. 1
2. 2
3. 3
4. 4

73 Stamens are:

I:	epipetalous in the flowers of brinjal.
II:	epiphyllous when attached to the perianth in the flowers of lily.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

74 China rose shows all the floral characters except:

1. Hypogynous flower
2. Alternate phyllotaxy
3. Vexillary aestivation of corolla
4. Monoadelphous stamens

75 Identify the incorrect statement/s:

Statement I:	Stamens are epipetalous in the flowers of lily.
Statement II:	Diadelphous stamen are seen in citrus.
Statement III:	A sterile stamen is called as staminate.

1.	Only **Statement I** and **Statement II**
2.	Only **Statement III**
3.	**Statement I**, **Statement II** and **Statement III**
4.	Only **Statement I** and **Statement III**

76 Diadelphous stamens are seen in:

1. China rose
2. Pea
3. Citrus
4. Mustard

77 Variation in the length of filaments within a flower is seen in:

1.	Pea	2.	*Citrus*
3.	*Salvia*	4.	Brinjal

78 Identify the incorrect statement:

I: Carpels are free in lotus and rose.

II: Carpels are fused in mustard and tomato.

1. Only **I**
2. Only **II**
3. Both **I** and **II**
4. Neither **I** nor **II**

79 The type of placentation seen in Pea is called as:

1.	Marginal	2.	Axile
3.	Parietal	4.	Basal

80 Axile placentation is not seen in:

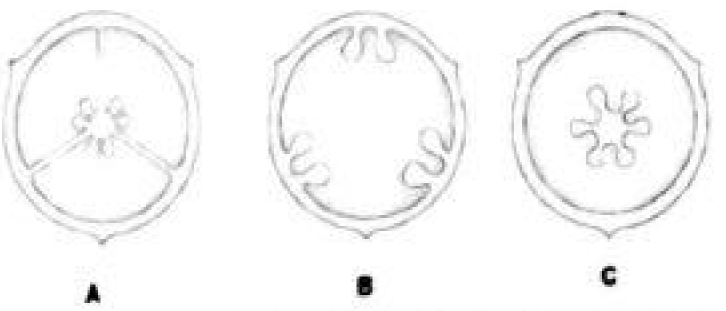
1.	China rose	2.	Tomato
3.	Lemon	4.	Pea

81 Identify the correctly matched pairs:

	Placentation	Feature
I:	Marginal	the ovules develop on the inner wall of the ovary or on peripheral part
II:	Axile	the ovules are borne on ridge along the ventral suture forming two rows
III:	Basal	the ovules are borne on central axis and septa are absent

1. Only **I**
2. **I**, **II** and **III**
3. Only **II**
4. None, all are incorrectly matched

82 Study the types of placentation and choose the correct match:



A	Axile	*Argemone*
B	Parietal	*Dianthus*
C	Free central	China rose

1. C only
2. A and B only
3. A, B and C
4. None; all are incorrect match

83 Which of the following descriptions accurately represents the placentation type known as "parietal"?

1.	Ovules are attached to the central axis of the ovary.
2.	Ovules are attached to the free central placenta which is not connected to the ovary wall.
3.	Ovules are attached to the walls of the ovary or to the extensions of it, and the ovary is unilocular.
4.	Ovules are attached directly to the ovary wall and the ovary is typically one-chambered.

84 Match each item in Column I with one in Column II and select the best match as your answer from the codes given:

	Column I [Placentation type]		Column II [Example]
A	Marginal	P	Pea
B	Axile	Q	*Dianthus*
C	Parietal	R	Tomato
D	Free central	S	*Argemone*

Codes:

	A	B	C	D
1.	P	R	Q	S
2.	R	P	Q	S
3.	R	P	S	Q
4.	P	R	S	Q

85 Ovary is one chambered but it becomes two chambered due to the formation of a false septum in:

1.	Mustard and *Argemone*	2.	*Argemone* and *Dianthus*
3.	Mustard and *Primrose*	4.	*Argemone* and *Primrose*

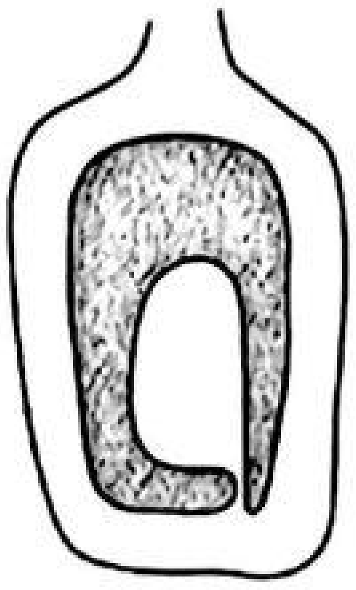
86 When the ovules are borne on central axis and septa are absent, the type of placentation is called as:

1. free central and is seen in *Dianthus* and *Primrose*
2. free central and is seen in Sunflower and Marigold
3. basal and is seen in *Dianthus* and *Primrose*
4. basal and is seen in Sunflower and Marigold

87 In *Dianthus* or *Primrose*, the ovule is:

1.	borne on a ridge along the ventral suture of the ovary
2.	attached to axial placenta in a multilocular ovary
3.	borne on central axis and septa are absent
4.	single and attached to placenta at the base of the ovary

88 The type of placentation shown in the given figure is seen in:



1. Marigold
2. *Argemone*
3. *Dianthus*
4. China rose

THE FRUIT

89 After fertilization, the ovules develop into _____ and ovary matures into _____.

1.	Fruit, Seeds	2.	Seeds, Fruit
3.	Seeds, Seed coat	4.	Embryo, Endosperm

90 In mango, the fruit is:

1.	drupe and mesocarp is fleshy and edible
2.	drupe and mesocarp is fibrous
3.	berry and mesocarp is fleshy and edible
4.	berry and mesocarp is fibrous

91 If the fruit is formed without the fertilization of ovary, it is called as:

1.	Parthenogenetic	2.	Parthenocarpic
3.	Aggregate	4.	False

92 The fruit in coconut:

1. is a berry with a fibrous epicarp
2. is a drupe with a fibrous mesocarp
3. is an aril with a fibrous endocarp
4. is a samara with a fibrous mesocarp

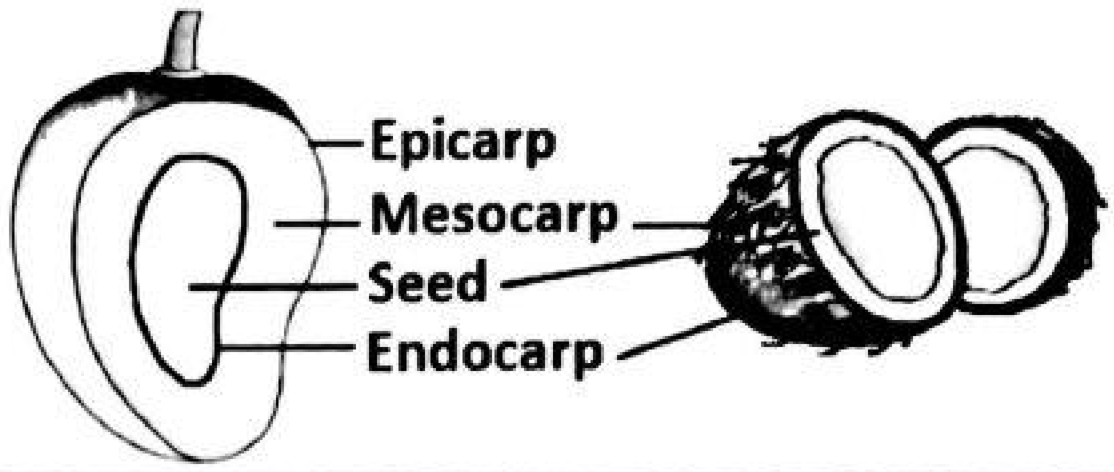
93 'Pericarp' is a derivative of which of the following structures?

1. integuments
2. endosperm
3. ovule wall
4. ovary wall

94 Drupes:

1.	develop from monocarpellary superior ovaries and are one seeded
2.	develop from monocarpellary inferior ovaries and are one seeded.
3.	develop from multicarpellary superior ovaries and are many seeded.
4.	develop from multicarpellary inferior ovaries and are many seeded.

95 The diagram shows the drupes of mango and coconut. Select the correct statements:



Statement I:	They develop from monocarpellary superior ovaries and are one seeded in both mango and coconut.
Statement II:	Mesocarp is fleshy and edible in mango while it is fibrous in coconut.

1. **Statement I** is incorrect; **Statement II** is correct
2. **Statement I** is correct; **Statement II** is correct
3. **Statement I** is correct; **Statement II** is incorrect
4. **Statement I** is incorrect; **Statement II** is incorrect

96 Identify the correct features of Mango and Coconut fruits.

(i)	In both, fruit is a drupe.
(ii)	Endocarp is edible in both.
(iii)	Mesocarp in Coconut is fibrous, and in Mango, it is fleshy.
(iv)	In both, the fruit develops from the monocarpellary ovary.

Select the correct option from below :

1. **(i)**, **(iii)** and **(iv)** only
2. **(i)**, **(ii)** and **(iii)** only
3. **(i)** and **(iv)** only
4. **(i)** and **(ii)** only

THE SEED

97 Seed coat is membranous and generally fused with the fruit wall in:

1.	Apple	2.	Maize
3.	Coconut	4.	Castor

98 Which of the following is an endospermic seed?

1.	Bean	2.	Gram
3.	Pea	4.	Castor

99 Generally, monocotyledonous seeds are endospermic. An important exception may be:

1.	Rice	2.	Wheat
3.	Orchids	4.	Pea

100 Scutellum is:

1.	shield shaped cotyledon in monocotyledons
2.	protein layer in the outer endosperm in monocotyledons
3.	starchy endosperm of dicotyledons
4.	stony hard seed coat in some seeds

101 The sheath covering the plumule in monocotyledonous seeds is called as:

1.	Coleorrhiza	2.	Coleoptile
3.	Testa	4.	Tegmen

102 Match each item in Column I regarding structure of a dicotyledonous seed with description in Column II and select the correct option from the codes given below:

	Column I		Column II
A.	Testa	a.	Outer layer of seed coat
B.	Tegmen	b.	Inner layer of seed coat
C.	Hilum	c.	Scar on seed coat through which the developing seeds were attached to the fruit
D.	Micropyle	d.	Small pore through which pollen tube penetrates

Codes

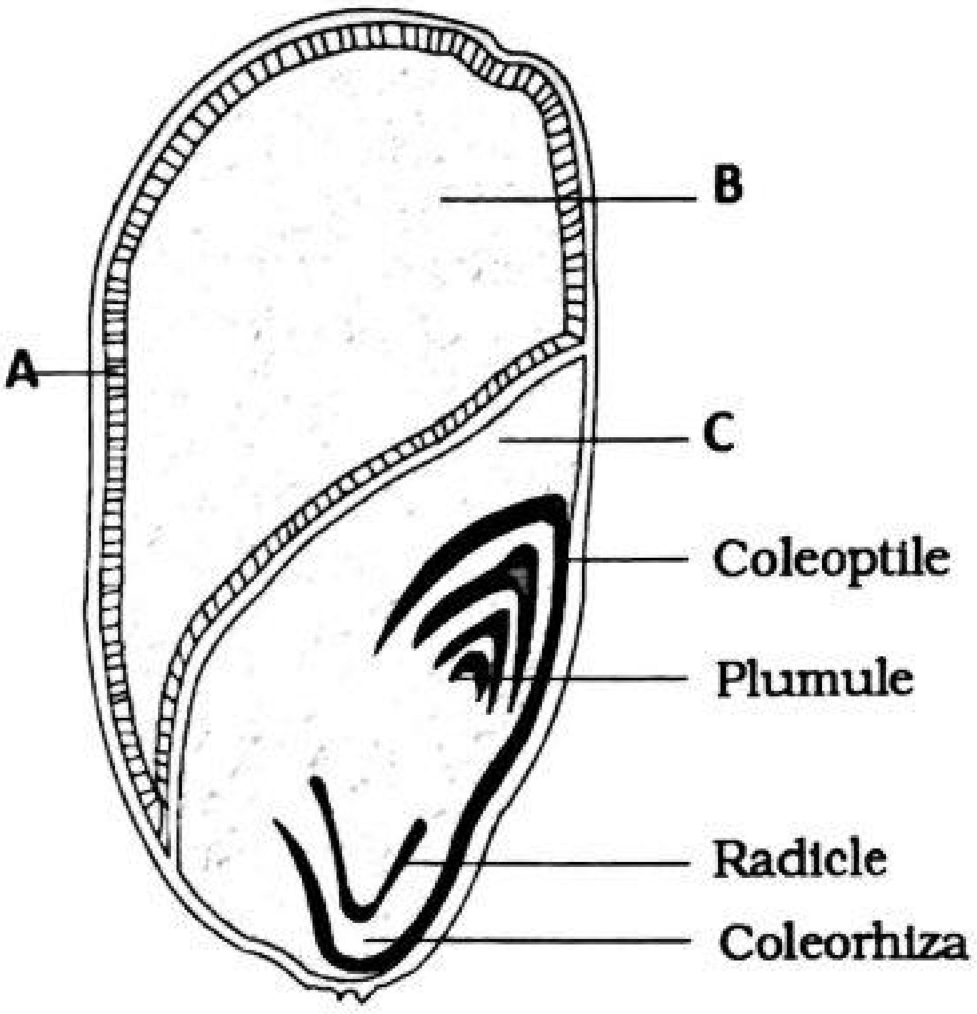
	A	B	C	D
1.	a	b	c	d
2.	b	a	c	d
3.	b	a	d	c
4.	a	b	d	c

103 Consider the given two statements:

Statement I:	A proteinaceous material, usually in the form of small granules, occurring in the outermost cell layer of the endosperm of wheat and other grains are called as aleurone layer.
Statement II:	The radical in a monocot seed is enclosed in a sheath called as coleoptiles.

1. **Statement I** is correct and **statement II** is incorrect
2. **Statement I** is incorrect and **statement II** is correct
3. **Statement I** and **statement II** are incorrect
4. **Statement I** and **statement II** are correct

104 Identify A, B, and C in the given figure:



	A	B	C
1.	Aleurone layer	Scutellum	Endosperm
2.	Scutellum	Endosperm	Aleurone layer
3.	Aleurone layer	Endosperm	Scutellum
4.	Endosperm	Scutellum	Aleurone layer

105 What structure covers the embryonic root in monocots?

1. hypodermis
2. scutellum
3. coleorhiza
4. radicle

106 Identify the correct statements regarding a typical dicot seed:

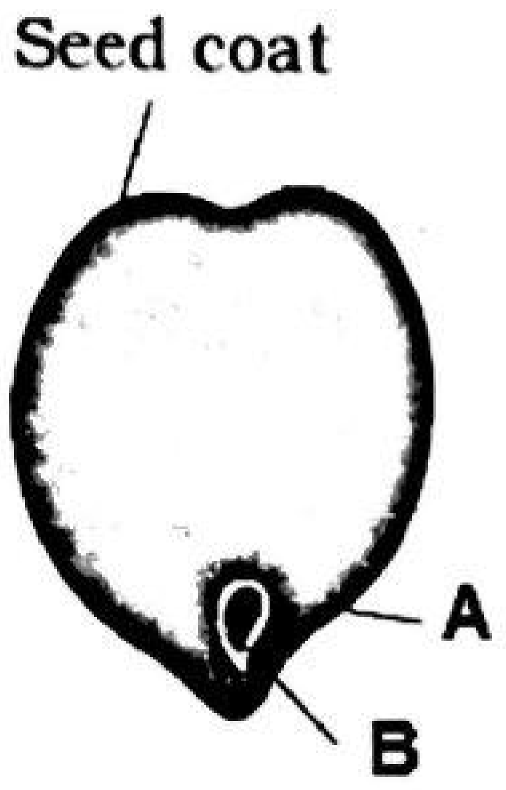
I.	The seed coat has two layers, the inner testa and the outer tegmen.
II.	The hilum is a scar on the seed coat through which the developing seeds were attached to the fruit.
III.	At the two ends of the embryonal axis are present the radicle and the plumule.

1. Only **I**
2. Only **II** and **III**
3. Only **III**
4. **I**, **II** and **III**

107 What structure will be seen both in a monocot seed and in a dicot seed?

1. Scutellum
2. Plumule
3. Coleoptile
4. Aleurone layer

108 Study the given diagram and select the correct statements:



Statement I:	A is micropyle through which the pollen tube had entered into the embryo sac.
Statement II:	B is hilum through which the developing seeds were attached to the fruit.

1. **Statement I** is correct; **Statement II** is correct
2. **Statement I**is correct; **Statement II** is incorrect
3. **Statement I** is incorrect; **Statement II** is correct
4. **Statement I** is incorrect; **Statement II** is incorrect

109 Micropyle present in a seed coat is important for:

1. Protection of the embryo
2. Facilitation of water and oxygen entry during germination
3. Allowing the pollen tube to emerge out of the embryo sac
4. Induction of dormancy in the embryo

110 Select the pair representing true homologous structures in the embryos of a typical dicot and a grass:

1. Coleorhiza and coleoptile
2. Coleoptile and scutellum
3. Cotyledons and scutellum
4. Hypocotyl and radicle

111 Match the following parts of a monocot seed with their functions:

	Column I		**Column II**
A.	Scutellum	1	Anchorage
B.	Coleorhiza	2	Protects radicle
C.	Coleoptile	3	Protects plumule
D.	Radicle	4	Acts as cotyledon

1. A-4, B-2, C-3, D-1
2. A-3, B-4, C-2, D-1
3. A-1, B-3, C-4, D-2
4. A-2, B-1, C-3, D-4

112 Key differences between monocot and dicot seeds include all of the following except:

1. Monocots have one cotyledon, while dicots have two
2. Monocot seeds usually contain endosperm, whereas dicot seeds do not
3. The seed coat is fused with the fruit in monocots but not in dicots
4. Monocots have scattered vascular bundles, while dicots have them in a ring

113 The mature seed of plants such as gram and peas, possess no endosperm, because

1. These plants are not angiosperms
2. There is no double fertilization in them
3. Endosperm is not formed in them
4. Endosperm gets used up by the developing embryo during seed development

SEMI-TECHNICAL DESCRIPTION OF A TYPICAL FLOWERING PLANT

114 In a floral formula, $P_{3+3}\ A_{3+3}\ \underline{G}_{(3)}$ would mean:

1.	6 undifferentiated tepals in two whorls of three, the same number and arrangement of stamens, and an inferior ovary with 3 free carpels
2.	6 undifferentiated tepals in two whorls of three, the same number and arrangement of stamens, and a superior ovary with 3 fused carpels
3.	6 undifferentiated petals in two whorls of three, the same number and arrangement of stamens, and an inferior ovary with 3 free carpels
4.	6 undifferentiated petals in two whorls of three, the same number and arrangement of stamens, and a superior ovary with 3 fused carpels

115 In a floral formula, the symbols K and $\underline{G}$ represent

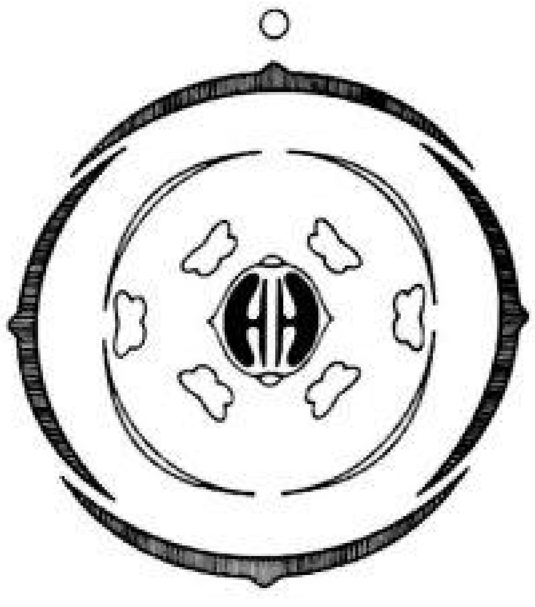
1.	Calyx and superior ovary respectively
2.	Calyx and inferior ovary respectively
3.	Corolla and inferior ovary respectively
4.	Corolla and superior ovary respectively

116 The given floral formula describes the members of family:

$$\oplus ⚥\ K_{2+2}\ C_4\ A_{2+4}\ \underline{G}_{(2)}$$

1. Solanaceae	2. Brassicaceae
3. Anacardiaceae	4. Orchidaceae

117 The given floral diagram describes the members of family:



1.	Solanaceae	2.	Brassicaceae
3.	Fabaceae	4.	Liliaceae

SOLANACEAE

118 Members of the Family Solanaceae have:

I:	bicarpellary obliquely placed, syncarpous superior ovary
II:	five stamens thar are epipetalous
III:	valvate aestivation of calyx and corolla

1.	Only **I** and **II**	2.	Only **I** and **III**
3.	Only **II** and **III**	4.	**I, II** and **III**

119 Match each item in Column I with one in Column II and select the correct match from the codes given:

	Column I **[Plant of Family Solanaceae]**		**Column II** **[Use]**
A.	*Ashwagandha*	P.	Ornamental
B.	Tobacco	Q.	Medicine
C.	*Petunia*	R.	Fumigatory

Codes:

	A	B	C
1.	P	Q	R
2.	Q	R	P
3.	R	P	Q
4.	P	R	Q

120 All the following plants belong to the family Solanaceae, except:

1.	Belladonna	2.	Tobacco
3.	Indigofera	4.	*Petunia*

121 Identify the incorrectly matched pair regarding floral characters of family Solanaceae:

1.	Flower symmetry	Actinomorphic
2.	Aestivation	Valvate
3.	Placenta	Parietal
4.	Fruit	Berry or Capsule

DESCRIPTION OF SOME IMPORTANT FAMILIES

122 All the following are floral characteristics of plants belonging to the Gramineae family except:
1. Flowers are characteristically arranged in spikelets
2. The flowers are usually unisexual
3. The perianth is reduced to two scales, called lodicules
4. The fruit is a caryopsis

123 All the following are members of family Malvaceae except:
1. Gossypium species
2. Abelmoschus esculentus
3. *Arabidopsis* thaliana
4. *Hibiscus* rosa-sinensis

124 Which family is regarded as the most advanced & highly evolved and is considered to occupy the highest position in the plant kingdom?
1. Compositae
2. Gramineae
3. Cruciferae
4. Orchidaceae

125 The given floral formula represents plants belonging to the family:

$$\oplus \, ⚥ \; \mathrm{Epi}_{3\rightarrow 8} \, K_{(5)} \, \overset{\frown}{C_{(5)} \, A_{\infty}} \, G_{(2-\infty)}$$

1.	Gramineae	2.	Malvaceae
3.	Cruciferae	4.	Leguminosae

126 Vegetables such as cabbage, broccoli, cauliflower, kale, Brussels sprouts belong to the family:
1. Gramineae
2. Malvaceae
3. Cruciferae
4. Leguminosae

127 Cotton, a major fibre crop and an important cash crop, belongs to plant family:
1. Brassicaceae
2. Malvaceae
3. Asteraceae
4. Poaceae

128 The given floral formula describes plants of family:

$$⚥ \; K_{2+2} \, C_4 \, A_{2+4} \, \underline{G_{(2)}}$$

1. Solanaceae
2. Fabaceae
3. Brassicaceae
4. Liliaceae

129 In pea:

1.	Flower is zygomorphic, aestivation is vexillary, stamens are diadelphous and placentation is marginal.
2.	Flower is actinomorphic, aestivation is vexillary, stamens are diadelphous and placentation is axile.
3.	Flower is zygomorphic, aestivation is twisted, stamens are monodelphous and placentation is parietal.
4.	Flower is actinomorphic, aestivation is imbricate, stamens are diadelphous and placentation is marginal.

130 The presence of stellate (star-shaped) hairs on the leaves, stems, and other parts of the plant is an important feature of the plants belonging to:

1.	Poaceae	2.	Malvaceae
3.	Solanaceae	4.	Cruciferae

131 What are the typical floral features of the Poaceae family?

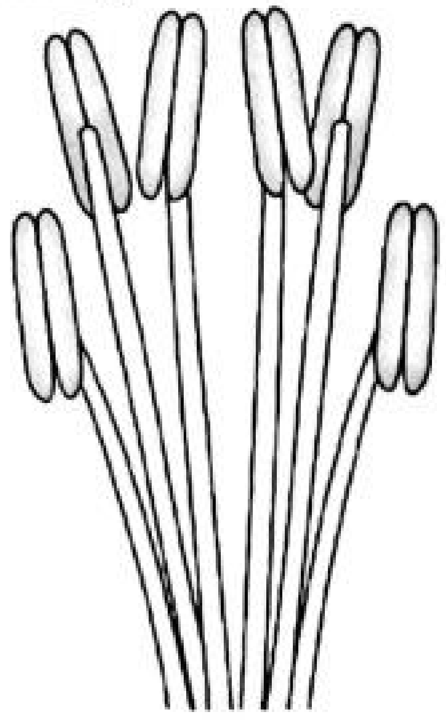
1.	Flowers are typically large with brightly colored petals.
2.	Flowers are small, wind-pollinated with reduced or absent petals.
3.	Flowers are often bisexual with a superior ovary.
4.	Flowers display radial symmetry with a large number of stamens.

132 Identify the correct match:

I:	China rose	-	Malvaceae
II:	Mustard	-	Brassicaceae
III:	Sunflower	-	Asteraceae

1. Only I and II
2. Only III
3. Only I and III
4. I, II and III

133 The condition of stamens shown in the figure is seen in members of the family:



1. Malvaceae
2. Solanaceae
3. Brassicaceae
4. Compositae

134 Which of the following is a characteristic floral feature of the Asteraceae family?

1.	Bilateral symmetry and inferior ovary.
2.	Flowers arranged in a head (capitulum) inflorescence.
3.	Presence of both male and female flowers on different plants.
4.	Flowers with 6 petals and 6 sepals.

MORPHOLOGY OF FLOWERING PLANTS - ANSWER KEY

1.	(4)	2.	(4)	3.	(4)	4.	(1)	5.	(1)	6.	(3)	7.	(3)	8.	(4)	9.	(4)	10.	(4)
11.	(3)	12.	(1)	13.	(3)	14.	(1)	15.	(3)	16.	(3)	17.	(4)	18.	(4)	19.	(1)	20.	(2)
21.	(3)	22.	(4)	23.	(2)	24.	(3)	25.	(1)	26.	(2)	27.	(1)	28.	(3)	29.	(2)	30.	(1)
31.	(1)	32.	(3)	33.	(1)	34.	(4)	35.	(3)	36.	(2)	37.	(4)	38.	(4)	39.	(3)	40.	(4)
41.	(2)	42.	(1)	43.	(4)	44.	(3)	45.	(3)	46.	(4)	47.	(1)	48.	(2)	49.	(2)	50.	(2)
51.	(3)	52.	(2)	53.	(3)	54.	(3)	55.	(3)	56.	(4)	57.	(4)	58.	(4)	59.	(3)	60.	(3)
61.	(1)	62.	(2)	63.	(1)	64.	(3)	65.	(2)	66.	(4)	67.	(1)	68.	(1)	69.	(4)	70.	(1)
71.	(2)	72.	(4)	73.	(3)	74.	(3)	75.	(3)	76.	(2)	77.	(3)	78.	(4)	79.	(1)	80.	(4)
81.	(4)	82.	(4)	83.	(3)	84.	(4)	85.	(1)	86.	(1)	87.	(3)	88.	(1)	89.	(2)	90.	(1)
91.	(2)	92.	(2)	93.	(4)	94.	(1)	95.	(2)	96.	(1)	97.	(2)	98.	(4)	99.	(3)	100.	(1)
101.	(2)	102.	(1)	103.	(1)	104.	(3)	105.	(3)	106.	(2)	107.	(2)	108.	(4)	109.	(2)	110.	(3)
111.	(1)	112.	(3)	113.	(4)	114.	(2)	115.	(1)	116.	(2)	117.	(2)	118.	(4)	119.	(2)	120.	(3)
121.	(3)	122.	(2)	123.	(3)	124.	(1)	125.	(2)	126.	(3)	127.	(2)	128.	(3)	129.	(1)	130.	(2)
131.	(2)	132.	(4)	133.	(3)	134.	(2)												

WHAT IS A CELL?

1 The structure of collagen, discovered by G. N. Ramachandran, is described as:

1. A left-handed alpha helix
2. A beta pleated sheet
3. A double helix
4. A triple helix

2 Cell is the fundamental structural and functional unit of all living organisms. This statement can be best justified by the fact that:

1.	The cells contain nucleic acids that contain genetic information
2.	A large number of organelles present in the cell perform various functions
3.	Anything less than a complete structure of a cell does not ensure independent living
4.	All multi-cellular organisms begin their life as a single celled zygote

3 Which of the following statements can explain the fact that many scientists do not consider viruses as living organisms?

1.	Metabolism and growth are defining properties of living organisms.
2.	Anything less than a complete structure of a cell does not ensure independent living.
3.	All cells arise from pre-existing cells.
4.	All biochemical reactions are catalyzed by enzymes.

4 Consider the given statements:

Statement I:	Anton von Leeuwenhoek first saw and described a live cell and Robert Brown discovered nucleus.
Statement II:	The invention of electron microscope revealed all the structural details of the cell.

1.	**Statement I** is correct and **Statement II** is incorrect
2.	Both **Statement I** and **Statement II** are correct but **Statement II** does not explain **Statement I**
3.	Both **Statement I** and **Statement II** are correct and **Statement II** correctly explains **Statement I**
4.	Only **Statement II** is correct

5 The nucleus was discovered by:

1. Robert Hooke
2. Robert Brown
3. Anton Von Leeuwenhoek
4. Purkinje

6 Unicellular organisms are capable of

I:	independent existence
II:	division
III:	performing the essential functions of life

1. Only **I** and **II** are correct
2. Only **I** and **III** are correct
3. Only **II** and **III** are correct
4. **I, II** and **III** are correct

7 The smallest living thing capable of an independent existence is:

1. a nucleoprotein
2. a low molecular weight RNA devoid of proteins
3. a cell
4. a cluster of cells

CELL THEORY

8 Consider the given two statements:

Statement I:	In 1838, Matthias Schleiden, a German botanist, examined a large number of plants and observed that the presence of cell wall is a unique character of the plant cells.
Statement II:	In 1839, Theodore Schwann, a British Zoologist, studied different types of animal cells and reported that cells had a thin outer layer which is today known as the 'plasma membrane'.

1. **Statement I** is correct; **Statement II** is correct
2. **Statement I** is correct; **Statement II** is incorrect
3. **Statement I** is incorrect; **Statement II** is correct
4. **Statement I** is incorrect; **Statement II** is incorrect

9 Who concluded, based on his studies on plant tissues, that the presence of cell wall is a unique character of plant cells?

1.	Matthias Shcleiden	2.	Theodore Schwann
3.	J. B. S. Haldane	4.	Rudolph Virchow

10 The famous aphorism 'omniscellula-e-cellula' was added to the cell theory in 1855 by

1.	Matthias Shcleiden	2.	Theodore Schwann
3.	J. B. S. Haldane	4.	Rudolph Virchow

11 How many of the given statements are true?

I:	All cells arise from pre-existing cells.
II:	Prokaryotic cells do not have any organelles.
III:	Eukaryotic cells have only membrane bound organelle.
IV:	Centrosome helps in cell division in plants and animals.

1. 1
2. 2
3. 3
4. 4

12 Which German botanist examined a large number of plants and observed that all plants are composed of different kinds of cells which form the tissues of the plant?

1. Theodore Schwann
2. Rudolf Virchow
3. Jan Evangelista Purkyně
4. Matthias Schleiden

13 "Omnis cellula-e cellula" means:

1. all cells have a cell membrane
2. only cells are capable of living existence
3. all cells come from cells
4. all cells are capable of dividing

14 Cell theory, as understood today, is:

I:	All living organisms are composed of cells and products of cells
II:	Cells of living organisms may or may not have cell walls
III:	All cells arise from pre-existing cells

1.	Only **I** and **II**	2.	Only **I** and **III**
3.	Only **II** and **III**	4.	**I, II** and **III**

AN OVERVIEW OF CELL

15 A Prokaryotic cell lacks:

I: a membrane bound nucleus
II: membrane bound organelles
III: ribosomes

1.	Only **I** and **II**	2.	Only **I**
3.	Only **II** and **III**	4.	Only **III**

16 Ribosomes are:

I:	bound by a single membrane only
II:	found in all cells – both eukaryotic as well as prokaryotic
III:	found in cytoplasm as well as chloroplasts, mitochondria and on RER

1.	Only **I** and **II**	2.	Only **I** and **III**
3.	Only **II** and **III**	4.	**I, II** and **III**

17 Centrosome:

1.	is a non- membrane bound organelle found in all cells which helps in cell division
2.	is a non- membrane bound organelle found in plant cells which helps in cell division
3.	is a non- membrane bound organelle found in animal cells which helps in DNA replication
4.	is a non- membrane bound organelle found in animal cells which helps in cell division

18 The average diameter of a human RBC is approximately:

1.	0.3 μm	2.	3.0 μm
3.	5.0 μm	4.	7.0 μm

19 All prokaryotic cells:

1. have a cell wall.
2. can fix atmospheric nitrogen.
3. lack a nuclear membrane.
4. can survive in the absence of oxygen.

20 Which of the following is a key difference between prokaryotic and eukaryotic cells?

1.	Only eukaryotic cells contain a cell membrane.
2.	Prokaryotic cells have membrane-bound organelles, while eukaryotic cells do not.
3.	Eukaryotic cells have a well-defined nucleus, while prokaryotic cells do not.
4.	Prokaryotic cells are generally larger than eukaryotic cells.

21 Match the following cell types with their average sizes given in the NCERT diagram:

	Column I		Column II
A	Human Red Blood Cell	i	0.1-0.5 μm
B	Bacteria	ii	20-30 μm
C	Yeast	iii	7-8 μm
D	Virus	iv	1-2 μm

1. A-iii, B-iv, C-ii, D-i
2. A-ii, B-i, C-iv, D-iii
3. A-iii, B-i, C-ii, D-iv
4. A-iv, B-iii, C-i, D-ii

PROKARYOTIC CELLS

22 Identify the incorrectly matched pair regarding shape of bacterial cells:

1.	Bacillus	Rod shaped
2.	Coccus	Spherical
3.	Vibrio	Icosahedral
4.	Spirillum	Spiral

23 The average size of mycoplasma ranges between:

1.	0.1 to 0.3 μm	2.	0.02 to 0.3 μm
3.	1 to 10 μm	4.	1 to 2 μm

24 If we compare a typical eukaryotic cell with a typical bacterial cell, it is expected that the size of eukaryotic cell is generally larger than a prokaryotic cell by a factor of:

1. 2
2. 5
3. 10
4. 100

25 The genomic DNA of a bacterial cell is:

1. circular and located on a single chromosome
2. circular and located on multiple chromosomes
3. linear and located on a single chromosome
4. linear and located on multiple chromosomes

26 The plasmid DNA in certain bacteria:

I:	is a small circular DNA and an integral part of the genomic DNA.
II:	confers certain unique phenotypic characters to such bacteria and one such character is resistance to antibiotics.

1. Only **I** is incorrect
2. Only **II** is incorrect
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

27 Resistance to an antibiotic is the character conferred to bacterial cell by:

1.	Peptidoglycan cell wall	2.	Main chromosomal DNA
3.	Plasmid DNA	4.	Satellite DNA

28 Regarding the genetic material in prokaryotes:

I:	The main chromosomal DNA is linear
II:	Plasmid DNA is circular

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

29 Identify the correct statement regarding the cell envelope of a prokaryotic cell:

I:	The outermost layer of the cell envelope is called as the glycocalyx which may be present as a loose sheath called the slime layer or a thick and tough capsule.
II:	The cell wall determines the shape of the cell and provides a strong structural support to prevent the bacterium from bursting or collapsing.
III:	Plasma membrane is selectively permeable in nature and interacts with the outside world.
IV:	Bacterial cells can be classified as Gram positive and Gram negative based on the staining properties of their plasma membrane.

1.	All except **IV**	2.	Only **I** and **II**
3.	**I, II, III** and **IV**	4.	Only **II, III** and **IV**

30 The terms 'slime layer' and 'capsule' can be used for which layer of the complex cell envelope of a typical bacterial cell?

1. Glycocalyx
2. Gram positive cell wall
3. Gram negative cell wall
4. Cell membrane

31 Which component of the cell envelope of a bacterial cell provides structural support to prevent the bacterium from bursting or collapsing?

1. Slime layer of glycocalyx
2. Capsule of glycocalyx
3. Cell wall
4. Cell membrane

32 Mesosomes in a bacterial cell:

I:	are formed by the extensions of plasma membrane into the cell.
II:	help in cell wall formation, DNA replication and distribution to daughter cells.
III:	contain pigments in cyanobacteria.

1. Only **I** and **II** are correct
2. Only **I** and **III** are correct
3. Only **II** and **III** are correct
4. **I, II** and **III** are correct

33 In some prokaryotes like cyanobacteria, there are membranous extensions into the cytoplasm which contain pigments and are called:

1. Mesosomes
2. Gas vacuoles
3. Inclusion bodies
4. Chromatophores

34 Cyanobacteria are not expected to have:

1. Chromatophores	2. Nitrogenase
3. Flagella	4. Gas vacuoles

35 Bacterial flagella differ from eukaryotic flagella in that they:

1.	Are primarily used for sensory purposes
2.	Are composed of microtubules
3.	Are enclosed in the cell wall
4.	Rotate rather than whip

36 A basal body is a part of bacterial:

1.	Inclusion bodies	2.	Chromosomal DNA
3.	Flagellum	4.	Plasmid

37 Identify the appendage present on the surface of some bacterial cells that help attach them to rocks in streams and also to the host tissues:

1.	Flagella	2.	Pili
3.	Fimbriae	4.	Cilia

38 Identify the incorrect statement regarding bacterial ribosomes:

1. They are associated with plasma membrane
2. They are 70 S with two subunits being 30 S and 40 S
3. Several ribosomes may attach to a single mRNA
4. They translate the mRNA into proteins

39 A polysome is:

1.	several mRNA molecules attached to a ribosome
2.	several ribosomes attached to a single mRNA
3.	the three major types of cellular RNAs attached to an mRNA molecule
4.	many ribosomes attached to the surface of endoplasmic reticulum

40 The prokaryotic cells:

1.	do not possess flagella
2.	possess flagella that are structurally similar to that of the eukaryotic flagella
3.	possess flagella that are structurally different from that of the eukaryotic flagella
4.	possess flagella made of tubulin protein and microtubules

41 Reserve material in prokaryotic cells is stored in the cytoplasm in the form of:

1.	inclusion bodies	2.	carboxysomes
3.	magnetosomes	4.	chromatophores

42 In a prokaryotic cell, phosphate granules, cyanophycean granules and glycogen granules are examples of:
1. inclusion bodies.
2. subunits of ribosomes.
3. enzyme rich locations in cell membrane.
4. products of plasmid genes.

EUKARYOTIC CELLS

43 Consider the two statements:

Statement I:	In eukaryotic cells there is an extensive compartmentalization of cytoplasm.
Statement II:	Membrane-bound organelles are present in a Eukaryotic cell.

1.	**Statement I** is correct and **Statement II** is incorrect
2.	Both **Statement I** and **Statement II** are correct but **Statement II** does not explain **Statement I**
3.	Both **Statement I** and **Statement II** are correct and **Statement II** correctly explains **Statement I**
4.	Only **Statement II** is correct

44 Which of the following is absent in almost all plant cells?

1.	Plastid	2.	Cell wall
3.	A large central vacuole	4.	Centriole

45 The lipid content of the cell membrane mainly consists of:

1.	Phosphoglycerides	2.	Cholesterol
3.	Unsaturated fatty acids	4.	Lipopolysaccharides

46 The approximate percent composition of proteins and lipids in the cell membrane of an erythrocyte is respectively:

1.	52% and 40%	2.	40% and 52%
3.	60% and 40%	4.	40% and 60%

47 The measure of fluidity of a cell membrane is:

1.	the ability of proteins to flip-flop between the two layers of phospholipids
2.	the ability of proteins to move laterally within the membrane
3.	the ability of lipids to flip-flop between the two layers of phospholipids
4.	the ability of lipids to move laterally within the membrane

48 The component molecules of the cell membrane have two main parts, the head and the tail. These parts are either hydrophobic (repelled by water) or hydrophilic (attracted to water). Which is which?

1.	Hydrophilic Head and Hydrophobic Tail
2.	Both Hydrophobic
3.	Hydrophilic Tail and Hydrophobic Head
4.	Both Hydrophilic

49 Identify the correct statement(s) regarding the structure of a typical cell membrane:

I:	The lipid component mainly consists of phosphoglycerides.
II:	Peripheral proteins are either lying on the surface of the membrane or partially buried in it.
III:	Carbohydrates are not a component of cell membrane.
IV:	Cholesterol is a lipid and is a part of the cell membranes of animal cells.

1.	Only **I**	2.	**II** and **III** only
3.	**I** and **IV** only	4.	**II** and **IV** only

50 The fluid mosaic model for the plasma membrane was proposed by:
1. H. Davson and J. Danielli
2. Schleiden and Schwann
3. Singer and Nicolson
4. Robert Brown and Robert Hooke

51 Sodium ions will be transported to the outside of the cell and potassium ions to the inside of the cell by:

1.	simple diffusion	2.	facilitated diffusion
3.	osmosis	4.	active transport

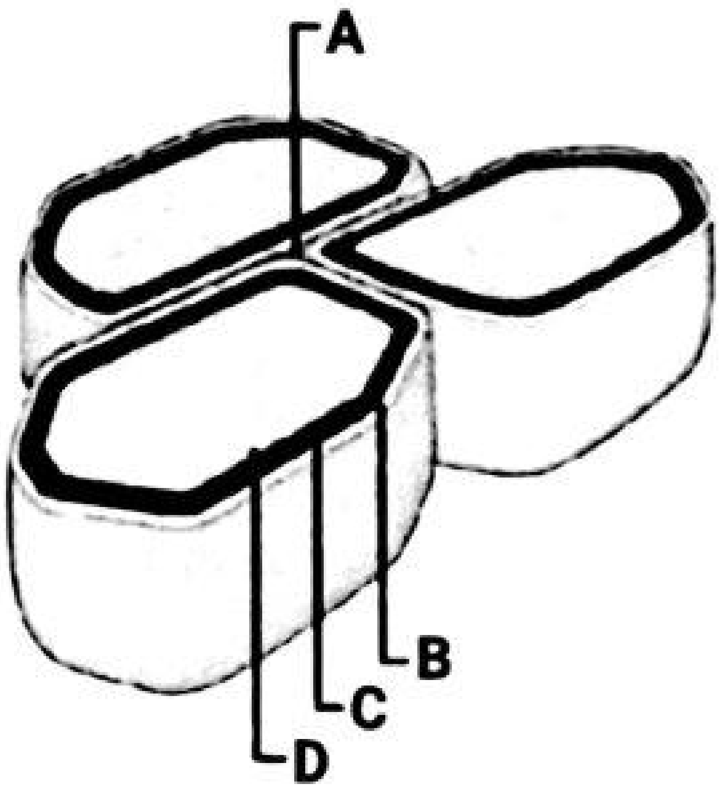
52 Which of the following movement across a cell membrane will require the utilisation of ATP energy?

1.	Movement of neutral solutes along the concentration gradient.
2.	Osmosis of water from higher to lower concentration.
3.	Movement of polar molecules along the concentration gradient facilitated by a carrier protein.
4.	Transport of ions against their concentration gradient.

53 Mannans, Xylans, Alginic acid and sulfonated polysaccharides are seen in the cell walls of:

1. Algae	2. Archaebacteria
3. Fungi	4. Plants

54 In the given diagram, the plasma membrane, primary cell wall, secondary cell wall and the middle lamella are shown respectively by:



1. D, B, C and A	2. D, C, B and A
3. D, A, B and C	4. A, B, C and D

55 Plant and animal cells are different. Identify the correct difference:

I:	Plant cells possess cell walls, plastids and a large central vacuole which are absent in animal cells.
II:	Animal cells have centrioles which are absent in almost all plant cells.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

56 How many of the given statements regarding cell wall are true?

I:	A non-living rigid structure called the cell wall forms an outer covering for the plasma membrane of fungi and plants.
II:	Cell wall not only gives shape to the cell and protects the cell from mechanical damage and infection, it also helps in cell-to-cell interaction and provides barrier to undesirable macromolecules.
III:	Algae have cell wall, made of cellulose, galactans, mannans and minerals like calcium carbonate, while in other plants it consists of cellulose, hemicellulose, pectins and proteins.
IV:	The cell wall of a young plant cell, the primary wall is capable of growth.
V:	The secondary wall is formed on the outer (towards middle lamella) side of the cell.

1. 2
2. 3
3. 4
4. 5

57 The middle lamella of a typical plant cell:

I:	mainly consists of calcium carbonate
II:	holds or glues the different neighbouring cells together
III:	is not traversed by plasmodesmata

1.	Only **II** is correct
2.	Only **I** is incorrect
3.	**I, II** and **III** are incorrect
4.	Only **II** and **III** are correct

58 Identify the incorrect statement regarding the cell wall of a plant cell:

1.	Cell wall helps in cell-to-cell interaction and provides barrier to undesirable macromolecules.
2.	Cell wall consists of cellulose, hemicellulose, pectins and proteins.
3.	The primary wall is capable of growth.
4.	The secondary wall is formed on the outer (towards middle lamella) side of the cell.

59 The endomembrane system of a typical eukaryotic cell includes all the following except:

1.	Lysosomes	2.	Golgi Apparatus
3.	Vacuole	4.	Mitochondria

60 Consider the given two statements:

Assertion(A):	The mitochondria, chloroplast and peroxisomes are not considered as part of the endomembrane system.
Reason (R):	The mitochondria, chloroplast and peroxisomes are single membrane bound organelles.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
3.	**(A)** is True; **(R)** is False
4.	Both **(A)** and **(R)** are False

61 The endoplasmic reticulum:

I:	divides the intracellular space into a luminal compartment and an extra-luminal [cytoplasm] compartment.
II:	is called as rough ER if it shows ribosomes attached to its inner surface.

1. both **I** and **II** are correct
2. only **I** is correct
3. only **II** is correct
4. Both **I** and **II** are incorrect

62 In animal cells, steroidal hormones are synthesized in the:

1.	Rough endoplasmic reticulum
2.	Smooth endoplasmic reticulum
3.	Golgi apparatus
4.	Lysosomes

63 Which of the following statements would not be applicable to the rough endoplasmic reticulum in a eukaryotic cell?

1.	Frequently observed in cells actively involved in protein synthesis and secretion
2.	Bear ribosomes on their surface
3.	Continuous with the outer membrane of the nucleus
4.	Sites of synthesis of steroidal hormones

64 Which of the following statements is true for a secretory cell?

1.	Golgi apparatus is absent
2.	Rough Endoplasmic Reticulum (RER) is easily observed in the cell
3.	Only Smooth Endoplasmic Reticulum (SER) is seen in the cell
4.	Secretary granules are formed in nucleus

65 The functions of Smooth Endoplasmic Reticulum in human cells do not include:

1. Protein synthesis
2. Detoxification
3. Production of steroid hormones
4. Storage of calcium ions

66 The number of correct statements regarding Golgi apparatus amongst the given statements will be:

I:	The concave trans surface is the maturing face.
II:	The cis and trans faces are entirely different but interconnected.
III:	It remains in close association with the endoplasmic reticulum.
IV:	Site of formation of glycoproteins and glycolipids.

1.	1	2.	2
3.	3	4.	4

67 An important site of the formation of glycoproteins and glycolipids in a eukaryotic cell is the:

1. Rough endoplasmic reticulum
2. Smooth endoplasmic reticulum
3. Golgi apparatus
4. Lysosomes

68 The organelle, involved in packaging materials, to be delivered either to intra-cellular targets or to be secreted outside the cells, is:

1. RER	2. SER
3. Golgi Apparatus	4. Mitochondria

69 Consider the given two statements:

Assertion (A):	The Golgi apparatus remains in close association with the endoplasmic reticulum.
Reason (R):	The *cis* and the *trans* faces of the organelle are entirely different, but interconnected.

1.	Both **(A)** and **(R)** are True but the **(R)** does not explain **(A)**.
2.	**(A)** is True but **(R)** is False.
3.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
4.	**(A)** is False but **(R)** is True.

70 Acid hydrolases are found in a single membrane bound organelle called:

1. Glyoxysome	2. Lysosome
3. Peroxisome	4. Ribosome

71 Lysosomes are:

I:	vesicular structures not bound by a membrane and formed by the process of packaging in the Golgi apparatus.
II:	very rich in almost all types of hydrolytic enzymes optimally active at an alkaline pH.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

72 A single membrane, tonoplast, binds the:

1. Inclusion bodies	2. Polysomes
3. Vacuoles	4. Lysosomes

73 Consider the two statements:

Statement I:	Concentration of ions is significantly higher in the vacuole than in the cytoplasm.
Statement II:	In plant cells, the vacuoles occupy up to 90 % of the volume of the cell.

1.	**Statement I** is correct and **Statement II** is incorrect
2.	Both **Statement I** and **Statement II** are correct but **Statement II** does not explain **Statement I**
3.	Both **Statement I** and **Statement II** are correct and **Statement II** correctly explains **Statement I**
4.	Only **Statement II** is correct

74 The vacuole is bound by tonoplast which is:

1. a single membrane.
2. a double layered membrane with pore complexes.
3. a protein rich S layer.
4. freely permeable to all ions.

75 A contractile vacuole will especially be highly useful for osmoregulation in:

1. a unicellular marine water organism.
2. a multicellular marine water organism.
3. a unicellular fresh water organism.
4. a multicellular large fresh water organism.

76 Which of the following organelles in a eukaryotic cell can only be seen after staining with vital dye?

1. Mitochondria	2. Chloroplasts
3. Nucleus	4. Endoplasmic reticulum

77 All the following are located in the mitochondrial matrix except:

1. Single circular DNA molecule
2. Proteins of electron transport chain
3. 70 S ribosomes
4. Enzymes of Kreb's cycle

78 Scientists think that mitochondria may have once been separate living organisms for all of the following reasons except that they

1. have cilia and flagella
2. have their own DNA
3. can reproduce
4. can produce their own proteins

79 Identify the incorrect statement regarding mitochondria?

1.	Unless specifically stained, mitochondria are not easily visible under the microscope.
2.	The number of mitochondria per cell is fixed irrespective of the physiological activity of the cells.
3.	The inner membrane forms a number of infoldings called the cristae towards the matrix.
4.	Mitochondria are the sites of aerobic respiration.

80 The organelles in a eukaryotic cell that have their own genome are:

1. RER and SER
2. Mitochondria and chloroplasts
3. Plasmids and plastids
4. Nucleus and ribosomes

81 Oxidative phosphorylation in eukaryotic cells takes place in:

1. Chloroplasts
2. Mitochondria
3. Peroxisomes
4. ER

82 The inner membrane of the mitochondria has infoldings called cristae. What is the primary function of these cristae?

1.	They contain enzymes for the citric acid cycle.
2.	They provide a large surface area for ATP production.
3.	They house the genetic material (mitochondrial DNA).
4.	They regulate the passage of molecules into and out of the mitochondria.

83 The types of plastids that store oils and fats are:

1. Leucoplasts	2. Amyloplasts
3. Elaioplasts	4. Aleuroplasts

84 Amyloplasts, leucoplasts and aleuroplasts are:

1.	Chromoplasts containing accessory photosynthetic pigments
2.	Pro-plastids capable of developing into any types of plastids
3.	Plastids found in green algae, photosynthesizing bacteria and protists
4.	Types of leucoplasts that store nutrients

85 Type of plastids that have fat soluble carotenoid pigments, like carotene xanthophylls, are present in:

1.	Chromoplasts	2.	Amyloplasts
3.	Aleuroplasts	4.	Elaioplasts

86 Identify the incorrectly matched pair:

	Structure	Size range
1.	Perinuclear space	10 – 50 nm
2.	Length of chloroplasts	2 – 5 μm
3.	Typical eukaryotic cell	10 – 20 μm
4.	Typical bacterium	1 – 2 μm

87 Like mitochondria, the chloroplasts:

I:	are also double membrane bound.
II:	also contain small, double-stranded circular DNA molecules and ribosomes.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

88 Identify the incorrect statement regarding chloroplasts:

1.	They are double membrane bound organelles
2.	Inner chloroplast membrane is relatively more permeable
3.	Chlorophyll pigments are present in the thylakoids
4.	Stroma contains enzymes required for synthesis of carbohydrates and proteins

89 The stroma of chloroplasts:

1.	is the space between the inner and the outer membrane of the chloroplast.
2.	is the location of chlorophyll pigments.
3.	contains enzymes required for the synthesis of carbohydrates and proteins.
4.	contains small, single-stranded linear DNA molecules and 80 S ribosomes.

90 George Palade was the first scientist to observe:

1. Lysosome	2. Peroxisome
3. Ribosome	4. Mesosome

91 Identify the incorrect statement regarding eukaryotic cells:

1.	Cell wall is made up of peptidoglycans
2.	80S type of ribosomes are present in the cytoplasm
3.	Mitochondria contain circular DNA
4.	Membrane bound organelles are present

92 An elaborate network of filamentous proteinaceous structures consisting of microtubules, microfilaments and intermediate filaments present in the cytoplasm of eukaryotic cells is collectively referred to as the:

1.	cytoskeleton	2.	MTOC
3.	Contractile elements	4.	vimentin

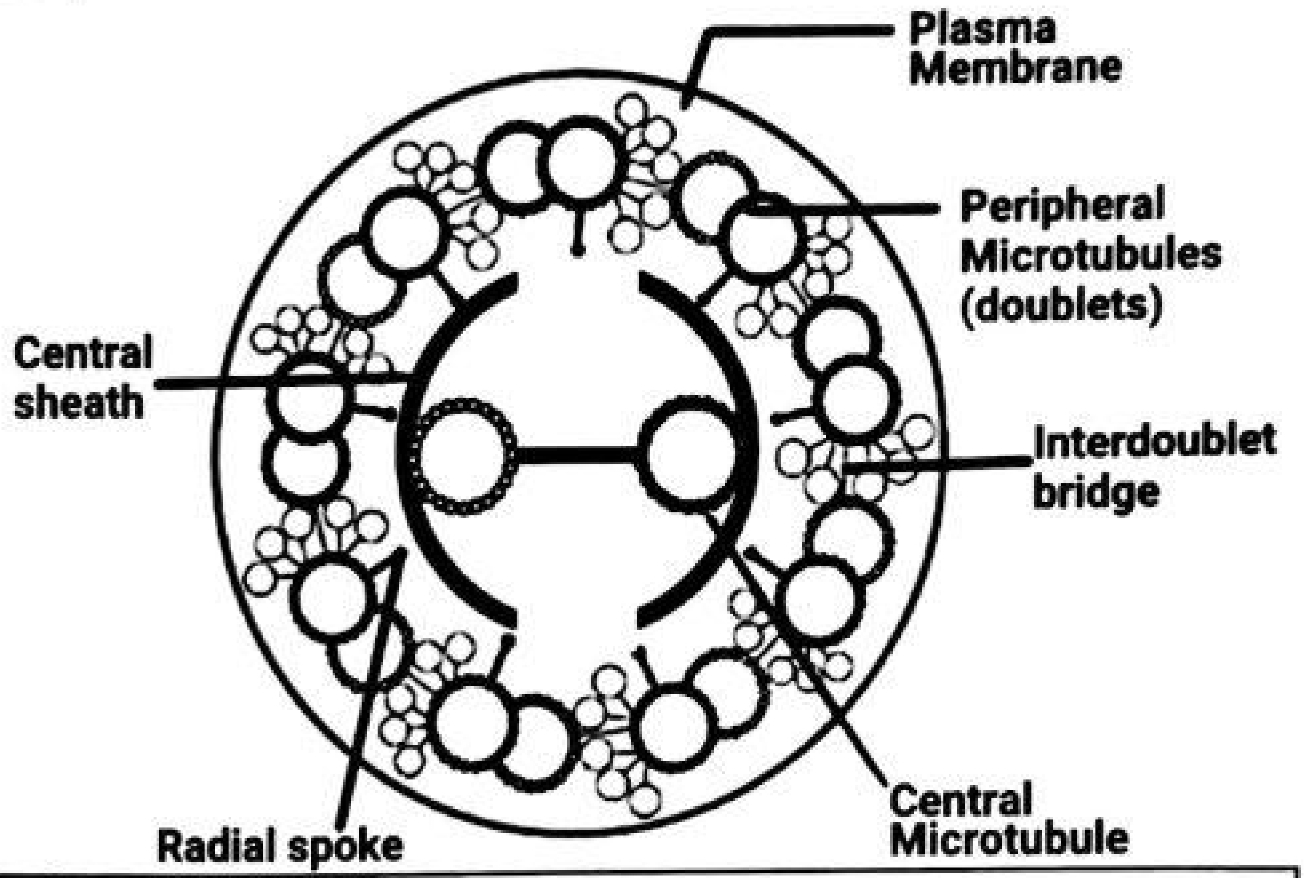
93 Maintaining the cell's shape, providing support, and facilitating cellular movement – these are the functions carried out primarily by:

1. Cell membrane
2. Cytoskeleton
3. Nucleus
4. Endoplasmic reticulum

94 Microtubules, microfilaments and intermediate filaments:

1.	are ribonucleoproteins.
2.	are part of cytoskeleton in both eukaryotic and prokaryotic cells.
3.	are involved in many functions such as mechanical support, motility, maintenance of the shape of the eukaryotic cell.
4.	are always deposited on cell surface and are never found in the cytoplasm.

95 The given diagram:



I:	shows the diagrammatic representation of the ultra-structure of centriole
II:	shows the 9 + 2 arrangement of the axonemal microtubules of cilia/flagella

1. Both **I** and **II** are correct
2. only **I** is correct
3. only **II** is correct
4. Both **I** and **II** are incorrect

96 Consider the two statements:

Statement I:	Both the cilium and the flagellum emerge from centriole-like structure called the basal body.
Statement II:	Basal body, centrioles, cilia and flagella have identical arrangement of microtubules in their ultrastructure.

1.	**Statement I** is correct and **Statement II** is incorrect
2.	Both **Statement I** and **Statement II** are correct but **Statement II** does not explain **Statement I**
3.	Both **Statement I** and **Statement II** are correct and **Statement II** correctly explains **Statement I**
4.	Only **Statement II** is correct

97 Which of the following statement about cilia is not correct?

1.	Organised beating of cilia is controlled by fluxes of Ca^{2+} across the membrane.
2.	Cilia are hair like cellular appendages.
3.	Cilia contain an outer ring of nine doublet microtubules surrounding two singlet microtubules.
4.	Microtubules of cilia are composed of tubulin.

98 In the ultrastructure of cilia/ flagella, the radial spokes connect one of the tubules of each peripheral doublet to:

1. the bridge of the central microtubules
2. another tubule to the doublet
3. the central sheath
4. dynein arms

99 Identify the incorrect statement regarding centrosome:

1.	it usually contains two cylindrical structures called centrioles
2.	both centrioles in centrosome are parallel to each other
3.	in centrioles, the peripheral fibril is a triplet
4.	the central part of the proximal region of the centriole is a proteinaceous hub

100 Identify the incorrect statement:

1.	Centrosome is an organelle usually containing two cylindrical structures called centrioles.
2.	Both the centrioles in a centrosome lie parallel to each other in which each has an organisation like the cartwheel.
3.	Centrioles are made up of nine evenly spaced peripheral fibrils of tubulin protein where each of the peripheral fibril is a triplet.
4.	The central part of the proximal region of the centriole is also proteinaceous and called the hub.

101 Consider the given two statements:

I: No animal cell has cell wall.

II: No animal cell has centrosome.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

102 Both cilium and flagellum emerge from centriole-like structure called the:

1.	Centrosome	2.	Centromere
3.	Blepharoplast	4.	Basal body

103 Identify the incorrect statement:

I:	Nuclear envelope consists of two parallel membranes with a perinuclear space between them.
II:	Nuclear pore is formed by the fusion of two nuclear membranes at points where they interrupt the nuclear envelope.
III:	Large and more numerous nucleoli are present in the cells actively carrying out protein synthesis.

1. Only **I**	2. Only **II**
3. Only **III**	4. None

104 The space between the two nuclear membranes is called the perinuclear space and is continuous with the:

1.	Nuclear pore complex	2.	Cytoplasm
3.	RER lumen	4.	Golgi lumen

105 The number of correct statements amongst the given statements would be:

I:	The outer nuclear membrane is usually continuous with ER and also bears ribosomes
II:	Nuclear pores allow movement of RNA and proteins in both directions between nucleus and cytoplasm
III:	Satellite chromosomes have non-staining secondary constrictions at constant locations
IV:	Microbodies are membrane bound vesicles containing various enzymes and are present in both plant and animal cells

1.	1	2.	2
3.	3	4.	4

106 Consider the given two statements:

Statement I:	The outer nuclear membrane usually remains continuous with the endoplasmic reticulum and also bears ribosomes on it.
Statement II:	Nuclear pores are the passages through which movement of RNA from nucleus to the cytoplasm and protein molecules from the cytoplasm to the nucleus takes place.

1.	**Statement I** is correct; **Statement II** is correct
2.	**Statement I** is correct; **Statement II** is incorrect
3.	**Statement I** is incorrect; **Statement II** is correct
4.	**Statement I** is incorrect; **Statement II** is incorrect

107 Identify the incorrect statement regarding nucleolus:

1.	Their content is continuous with nucleoplasm
2.	It is site for active rRNA synthesis
3.	Their number is always one per nucleus
4.	Larger nucleoli are present in cells actively carrying out protein synthesis

108 Consider the two statements:

I:	The content of nucleolus is continuous with the rest of the nucleoplasm.
II:	Nucleolus is the site for active ribosomal RNA synthesis.

1.	**I** is correct and **II** is incorrect
2.	Both **I** and **II** are correct but **II** does not explain **I**
3.	Both **I** and **II** are correct and **II** correctly explains **I**
4.	Only **II** is correct

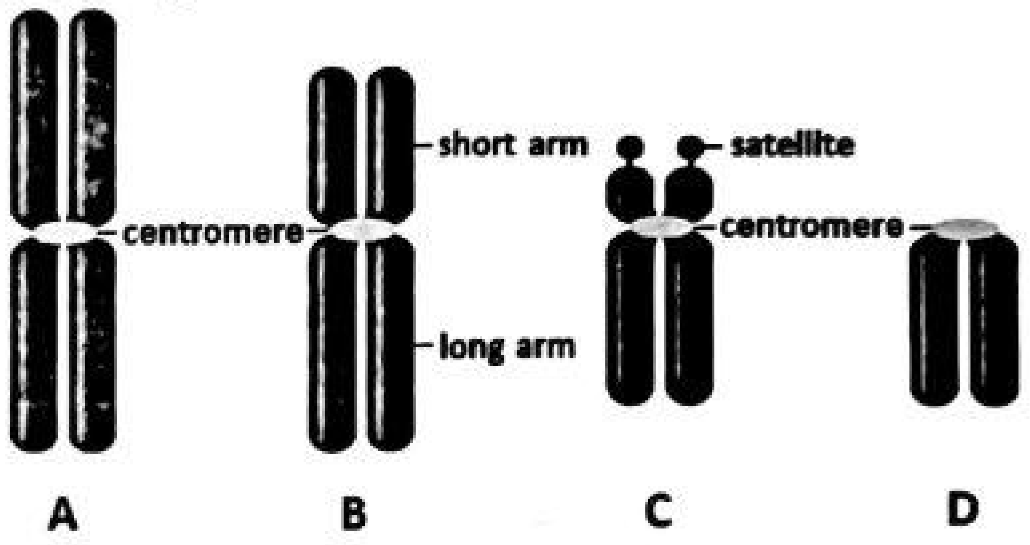
109 When the centromere in a chromosome is located close to its end, the chromosome is called as:

1.	Metacentric	2.	Sub-metacentric
3.	Acrocentric	4.	Telocentric

110 Spindle fibers are attached to the chromosome in the region of:

1.	Centrosome	2.	Chromomere
3.	Chromonema	4.	Kinetochore

111 Which alphabet represents telocentric chromosomes in the given figure?



1. A
2. B
3. C
4. D

112 What would be true regarding the names of chromosomes described in the given table?

I:	Centromere placement very close to the top, p arms not visible
II:	q arms are much longer than the p arms.
III:	p and q arms are very close in length but not equal.
IV:	p and q arms are equal in length.

A:	I is Acrocentric and II is Telocentric
B:	III is Metacentric and IV is Sub-metacentric
C:	I is Telocentroic and II is Acrocentric
D:	III is sub-metacentric and IV is Metacentric

1. **A** and **B** only
2. **A** and **C** only
3. **C** and **D** only
4. **B** and **D** only

113 Sometimes a few chromosomes have non-staining secondary constrictions at a constant location. This gives the appearance of a small fragment called the:

1. telomere
2. satellite
3. bands
4. chromomere

114 Kinetochore:

1.	is not visible in dividing cells.
2.	is also called the primary constriction
3.	is a proteinaceous disc shaped structure on the sides of the centromeres.
4.	holds two chromatids of a chromosome.

115 A peroxisome is a membrane-bound organelle found in the cytoplasm of virtually all eukaryotic cells and contains several oxidases and catalases. Why type of structure is the peroxisome?

1.	Inclusion body	2.	FTS-Z elements
3.	Microbody	4.	Lysosomes

CELL - THE UNIT OF LIFE - ANSWER KEY

1.	(4)	2.	(3)	3.	(2)	4.	(2)	5.	(2)	6.	(4)	7.	(3)	8.	(3)	9.	(2)	10.	(4)
11.	(1)	12.	(4)	13.	(3)	14.	(2)	15.	(1)	16.	(3)	17.	(4)	18.	(4)	19.	(3)	20.	(3)
21.	(1)	22.	(3)	23.	(1)	24.	(3)	25.	(1)	26.	(1)	27.	(3)	28.	(2)	29.	(1)	30.	(1)
31.	(3)	32.	(1)	33.	(4)	34.	(3)	35.	(4)	36.	(3)	37.	(3)	38.	(2)	39.	(2)	40.	(3)
41.	(1)	42.	(1)	43.	(3)	44.	(4)	45.	(1)	46.	(1)	47.	(2)	48.	(1)	49.	(3)	50.	(3)
51.	(4)	52.	(4)	53.	(1)	54.	(1)	55.	(3)	56.	(3)	57.	(1)	58.	(4)	59.	(4)	60.	(3)
61.	(2)	62.	(2)	63.	(4)	64.	(2)	65.	(1)	66.	(4)	67.	(3)	68.	(3)	69.	(1)	70.	(2)
71.	(4)	72.	(3)	73.	(2)	74.	(1)	75.	(3)	76.	(1)	77.	(2)	78.	(1)	79.	(2)	80.	(2)
81.	(2)	82.	(2)	83.	(3)	84.	(4)	85.	(1)	86.	(2)	87.	(3)	88.	(2)	89.	(3)	90.	(3)
91.	(1)	92.	(1)	93.	(2)	94.	(3)	95.	(3)	96.	(1)	97.	(1)	98.	(3)	99.	(2)	100.	(2)
101.	(1)	102.	(4)	103.	(4)	104.	(3)	105.	(4)	106.	(1)	107.	(3)	108.	(2)	109.	(3)	110.	(4)
111.	(4)	112.	(3)	113.	(2)	114.	(3)	115.	(3)										

CELL CYCLE

1 Consider the given two statements:

Assertion (A):	Cell division is a very important process in all living organisms.
Reason (R):	During the division of a cell, DNA replication and cell growth also take place.

1.	**(A)** is True; **(R)** is False
2.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**
3.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**
4.	**(A)** is False; **(R)** is True

2 The events of a cell cycle:

I:	are themselves under genetic control
II:	have to take place in a coordinated way

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

3 Which of the following is a continuous process during cell cycle?

a. Growth
b. DNA synthesis

1. Only a
2. Only b
3. Both a and b
4. Neither a nor b

4 A typical eukaryotic cell cycle is illustrated by human cells in culture. These cells divide once in:

1. about 90 minutes.
2. approximately every 24 hours.
3. nearly one week.
4. 120 days on an average.

5 The number of correct statements from the given statements regarding cell division in human somatic cells will be:

I:	The M Phase represents the phase when the actual cell division or mitosis occurs.
II:	The interphase represents the phase between two successive M phases.
III:	The interphase lasts more than 95% of the duration of cell cycle.
IV:	During interphase, the cell is metabolically not active.

1. 1
2. 2
3. 3
4. 4

6 The phase of the cell cycle that lasts for the least time is the:

1.	G_1 phase	2.	S phase
3.	G_2 phase	4.	M phase

7 Consider the given two statements:

Assertion (A):	The interphase of the cell cycle is also called the resting phase.
Reason (R):	No metabolic activity takes place inside the cell during the interphase.

1.	**(A)** is True; **(R)** is False
2.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**
3.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**
4.	**(A)** is False; **(R)** is True

8 Identify the correct statements regarding G_1 phase of the cell cycle:

I:	It is the post-mitotic gap phase
II:	The cell is metabolically active and grows continuously
III:	Cell replicates its DNA

1.	**Only II**	2.	**I and II only**
3.	**Only I**	4.	**I, II and III**

9 What would be the DNA content and chromosome number in a cell at the end of S phase with 2C DNA content and 2N chromosome number in G_1?

1.	4C and 4N	2.	2C and 4N
3.	4C and 2N	4.	2C and 2N

10 Proteins are synthesized in preparation for mitosis during:

1.	G_1 phase	2.	S phase
3.	G_2 phase	4.	M phase

11 The phase of the cell cycle during which DNA replication takes place is:

1.	G_1 phase	2.	S phase
3.	G_2 phase	4.	M phase

12 The centrosome duplicates during:

1.	Early Prophase	2.	Late Prophase
3.	S phase	4.	G_2 phase

13 The cells in the quiescent stage [G_0] phase of the cell cycle:

1.	exit from the S phase
2.	continue the events of cell cycle and complete the division
3.	are metabolically active
4.	cannot ever proliferate

14 Cells which are not dividing are likely to be at

1.	G_1	2.	G_2
3.	G_0	4.	S phase

15 Consider the given statements:

Statement I:	If the initial number of chromosomes in a cell at G_1 phase is 2N and DNA content is 2C, the number of chromosomes and the content of DNA at the end of the S-phase will be 4N and 4C.
Statement II:	The cell replicates its DNA and doubles its number of chromosomes during the S-phase of the cell cycle.

1.	**Statement I** is correct; **Statement II** is correct and **Statement II** correctly explains **Statement I**
2.	**Statement I** is correct; **Statement II** is correct but **Statement II** does not correctly explain **Statement I**
3.	**Statement I** is incorrect and **Statement II** is correct
4.	**Statement I** and **Statement II** are incorrect

16 Onion root tip cells have 16 chromosomes in each cell. How many chromosomes will the cell respectively have at G_1 phase, after S phase, and after M phase?

1. 8, 8, 8
2. 16, 16, 32
3. 16, 16, 16
4. 16, 32, 32

17 In plant cells:

I:	during the S phase, DNA replication begins in the nucleus.
II:	during the S phase, the centriole duplicates in the cytoplasm.
III:	during the G_2 phase, proteins are synthesised in preparation for mitosis
IV:	cell growth stops during S phase and G_2 phase.

1. **I** is correct; **II**, **III** & **IV** are incorrect
2. **I** & **IV** are correct; **II** & **III** are incorrect
3. **I** & **III** are correct; **II** and **IV** are incorrect
4. All the statements: **I**, **II**, **III** & **IV** are correct.

18 Consider the given two statements:

Statement I:	In animals, mitotic cell division is only seen in the diploid somatic cells.
Statement II:	Plants can show mitotic divisions in both haploid and diploid cells.

1. **Statement I** and **Statement II** are correct
2. **Statement I** is correct but **Statement II** is incorrect
3. **Statement I** is incorrect but **Statement II** is correct
4. **Statement I** and **Statement II** are incorrect

19 Consider the given two statements:

Statement I:	In male honeybees, haploid cells divide by mitosis.
Statement II:	Higher plants show mitotic divisions only in diploid cells.

1.	**Statement I** is correct and **Statement II** is incorrect.
2.	**Statement I** is incorrect and **Statement II** is incorrect.
3.	**Statement I** is correct and **Statement II** is correct.
4.	**Statement I** is incorrect and **Statement II** is correct.

M PHASE

20 Mitosis is also called 'equational division' because:

1.	the number of chromosomes in both daughter cells are the same
2.	the sum of the number of chromosomes in two daughter cells is equal to the number of chromosomes in the parent cell
3.	each progeny cell receives only one set of chromosomes from the parent cell
4.	the number of chromosomes in the parent and the progeny cells is the same

21 The correct chronology of stages of karyokinesis in mitosis is:

1. Prophase – Anaphase – Metaphase – Telophase
2. Prophase – Metaphase – Anaphase – Telophase
3. Prophase – Metaphase – Telophase – Anaphase
4. Telophase – Anaphase – Metaphase – Prophase

22 Mitosis accomplishes:

I:	the segregation of duplicated chromosomes into daughter nuclei (karyokinesis)
II:	division of the cell into two daughter cells by the separation of cytoplasm (cytokinesis)

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

23 Prophase of mitosis is not characterized by:

1. condensation of chromatin
2. migration of centrosomes to opposite poles
3. formation of mitotic apparatus
4. pairing of homologous chromosomes

24 Cells at the end of prophase, when viewed under the microscope, show:

1.	Nuclear envelope	2.	Nucleolus
3.	Mitochondria	4.	Endoplasmic reticulum

25 The components of nuclear envelope are dismantled during:

1.	prophase and reconstructed during telophase
2.	prophase and reconstructed during anaphase
3.	metaphase and reconstructed during telophase
4.	metaphase and reconstructed during anaphase

26 Identify the incorrect statement regarding prophase stage of mitosis:

1.	It follows the G_2 phases of interphase.
2.	It is marked by the initiation of condensation of chromosomal material.
3.	The centrosome undergoes duplication during this phase in animal cells.
4.	By the end of this phase, chromosomes are seen to be composed of two chromatids attached together at the centromere.

27 The completion of prophase of mitosis is marked by the following characteristic events except:

1.	Chromosomal material condenses to form compact mitotic chromosomes.
2.	Chromosomes are seen to be composed of two chromatids attached together at the centromere.
3.	Centrosome undergoes duplication during prophase.
4.	Each centrosome radiates out microtubules called asters.

28 Identify the incorrect statement regarding mitosis:

1.	A single nucleus gives rise to two identical daughter nuclei.
2.	The daughter nuclei are genetically identical to the parent nucleus.
3.	The centromeres divide at the onset of anaphase.
4.	Homologous chromosomes synapse in prophase.

29 The start of the second phase of mitosis, metaphase, is marked by:

1. complete disintegration of the nuclear envelope
2. alignment of chromosomes at the equatorial plate
3. de-condensation of chromatin
4. reappearance of the nucleolus

30 Consider the given two statements:

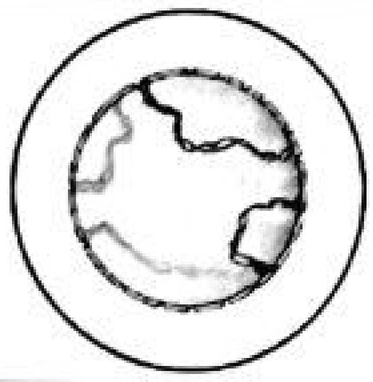
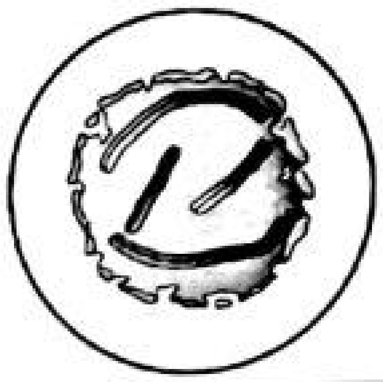
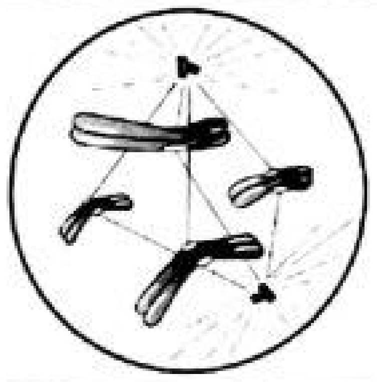
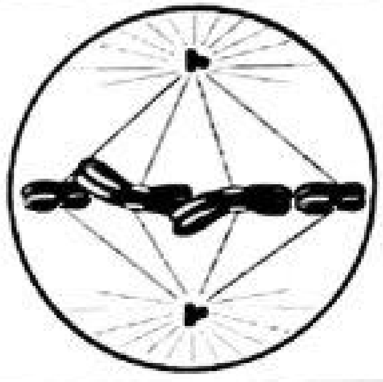
I:	Morphology of chromosomes is best studied at metaphase
II:	At this stage, a chromosome is made up of two sister chromatids, held together at the centromere

1. Both **I** and **II** are True and **II** explains **I**
2. Both **I** and **II** are True but **II** does not explain **I**
3. **I** is True but **II** is False
4. **I** is False but **II** is True

31 At the metaphase plate:

1.	The sister chromatids of a chromosome are connected by their kinetochores to the spindle fibers from the same pole
2.	The non sister chromatids of a chromosome are connected by their kinetochores to the spindle fibers from the same pole
3.	The sister chromatids of a chromosome are connected by their kinetochores to the spindle fibers from the opposite poles
4.	The non sister chromatids of a chromosome are connected by their kinetochores to the spindle fibers from the opposite poles

32 Which of the following cells is in transition to metaphase?

1		2.	
3.		4.	

33 Consider the given features:

A:	Spindle fibers attached to kinetochores of chromosome.
B:	Chromosomes are moved to spindle equator and get aligned along metaphase plate through spindle fibers to both poles.

The above mentioned features are seen in which phase of mitosis?

1.	Prophase	2.	Metaphase
3.	Anaphase	4.	Telophase

34 Attachment of spindle fibers to kinetochores of chromosomes becomes evident in:

1.	Anaphase	2.	Telophase
3.	Prophase	4.	Metaphase

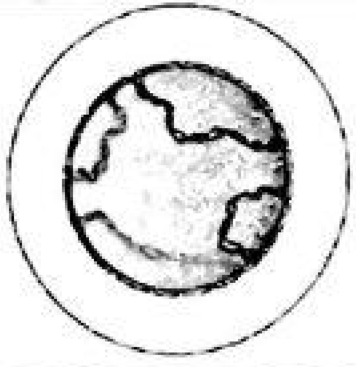
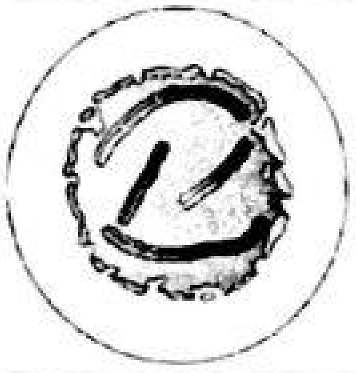
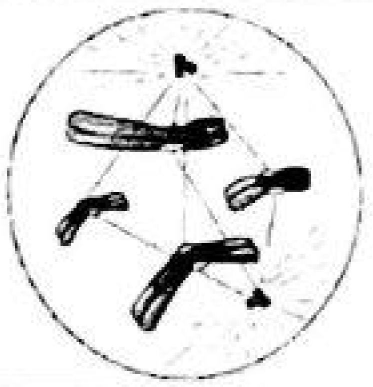
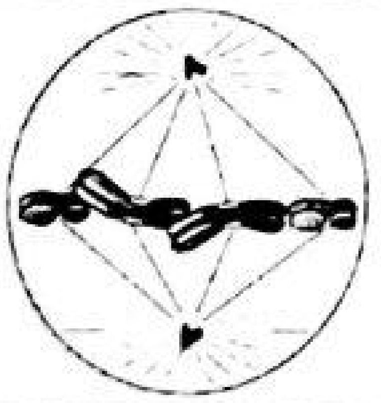
35 During which stage of mitosis do the following events occur?
I. Centromeres split and chromatids separate
II. Chromatids move to opposite poles

1.	Prophase	2.	Metaphase
3.	Anaphase	4.	Telophase

36 As each chromosome moves away from the equatorial plate during the anaphase of mitosis:

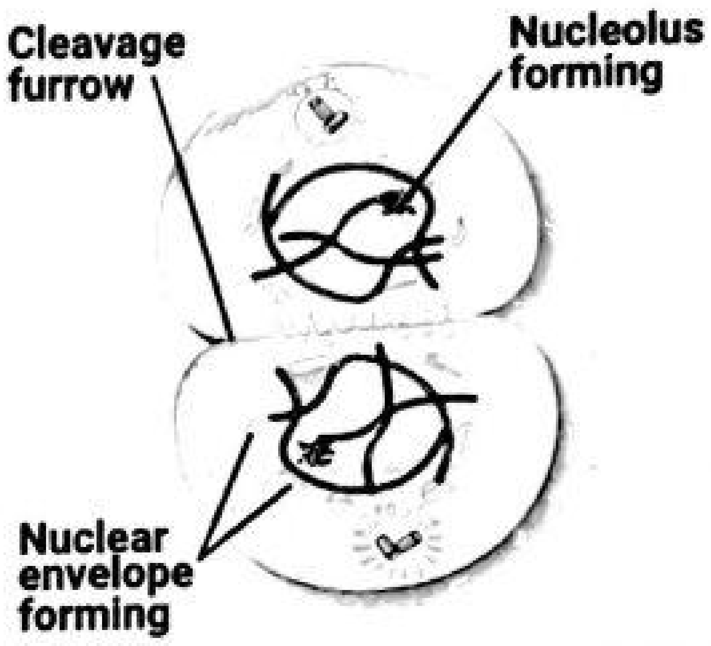
1.	the arms of each chromosome remain directed towards the pole and hence at the leading edge, with the centromere of the chromosome trailing behind.
2.	the arms of each chromosome and the centromere remain directed towards the pole and hence at the leading edge.
3.	the centromere of each chromosome remains directed towards the pole and hence at the leading edge, with the arms of the chromosome trailing behind.
4.	the centromere and the arms of each chromosome do not move and remain at the metaphase plate.

37 Identify the incorrectly matched pair:

1.		Early Prophase
2.		Late Prophase
3.		Transition to Metaphase
4.		Anaphase

38 All the following key events take place during telophase of mitosis except:
1. Chromosomes cluster at the opposite spindle poles
2. Chromosomes become discrete
3. Nuclear envelope reforms
4. Nucleolus, ER and Golgi complex reform

39 Identify the stage of mitosis shown in the given diagram:



1.	Prophase	2.	Metaphase
3.	Anaphase	4.	Telophase

40 All the following events take place during the telophase stage of mitosis except:

1.	Chromosomes cluster at opposite spindle poles and their identity is lost as discrete elements.
2.	Nuclear envelope develops around the chromosome clusters at each pole forming two daughter nuclei.
3.	Nucleolus, Golgi complex and ER re-form.
4.	Microtubules get organised into spindle fibres.

41 Consider the following key events:

I:	Chromosomes cluster at opposite spindle poles and their identity is lost as discrete elements.
II:	Nucleolus, Golgi complex and ER reform

The stage of mitosis characterized by these key events is:

1.	Prophase	2.	Metaphase
3.	Anaphase	4.	Telophase

42 Identify the incorrect statement regarding cytokinesis:

1.	Animal cells divide by cleavage furrow
2.	Cell plate formation takes place during cytokinesis in plant cells
3.	The cell wall formation in plant cells starts near the existing lateral walls and grows inwards
4.	At cytokinesis, mitochondria and plastids are distributed between daughter cells

43 Consider the given two statements:

Statement I:	In animal cells, cytokinesis is achieved by the appearance of a furrow in the plasma membrane.
Statement II:	During cytokinesis in plant cells, the formation of the new cell wall begins with the formation of a simple precursor called the cell plate that represents the middle lamella between the walls of the two adjacent cells.

1. **Statement I** and **Statement II** are correct
2. **Statement I** is correct but **Statement II** is incorrect
3. **Statement I** is incorrect but **Statement II** is correct
4. **Statement I** and **Statement II** are incorrect

44 In a plant cell, cytokinesis is achieved by:

1.	the appearance of a furrow in the plasma membrane which gradually deepens and ultimately joins in the centre dividing the cell cytoplasm into two.
2.	the appearance of the cell-plate and the formation starts in the centre of the cell and grows outward to meet the existing lateral walls.
3.	the appearance of a furrow in the plasma membrane which starts in the centre of the cell and grows outward to meet the existing lateral walls.
4.	the appearance of the cell-plate and the formation starts in the periphery of the cell and grows inward to meet the existing central walls.

45 In plant cell division, the formation of the new cell wall begins with the formation of a simple precursor called:

1.	the cell plate that represents the middle lamella
2.	the cell plate that represents the primary cell wall
3.	the cleavage furrow that represents the middle lamella
4.	the contractile ring that represents the primary cell wall

46 Consider the given two statements:

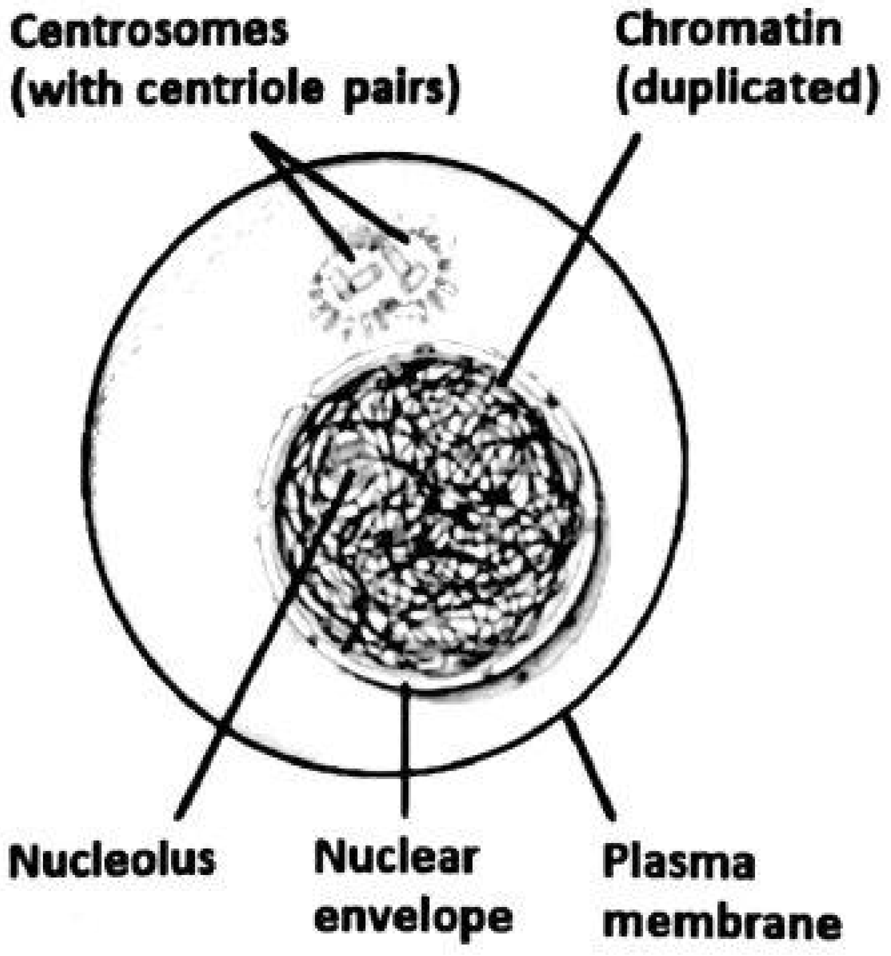
I:	The plants can show mitotic divisions in both haploid and diploid cells.
II:	Plant cells divide by the formation of a cleavage furrow.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

47 Telophase of mitosis is characterised by all the following events, except:

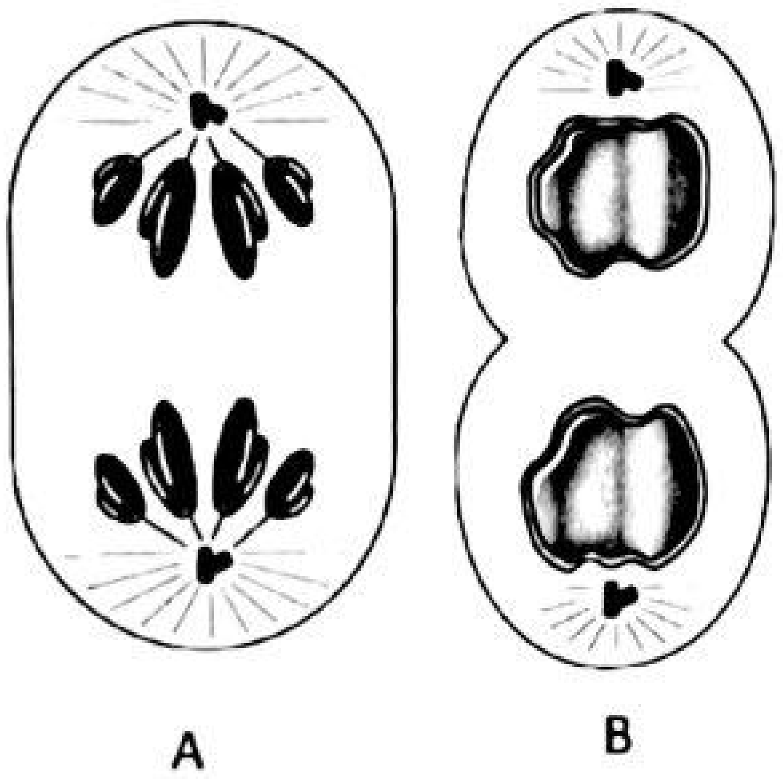
1.	Chromosomes cluster at opposite spindle poles, and their identity is lost as discrete elements.
2.	Nuclear envelope develops around the chromosome clusters at each pole, forming two daughter nuclei.
3.	Nucleolus, Golgi complex and ER reform.
4.	Pairing of homologous chromosomes.

48 What stage of the cell cycle is the cell shown in the figure at?



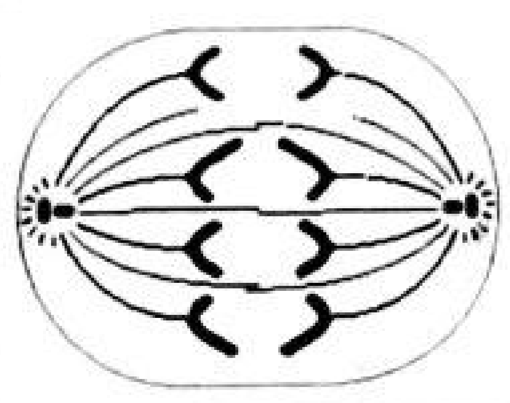
1. G_1
2. G_0
3. G_2
4. S

49 The given figure shows a cell at various stages of mitosis. What will be the number of chromosomes and content of DNA in the cells shown if the number of chromosomes and the content of DNA was 2N and 2C respectively at G_1 phase?

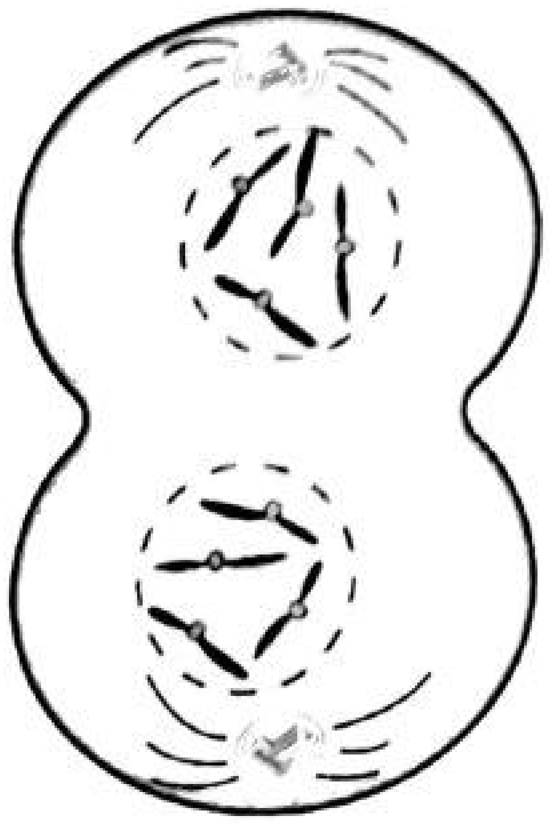


1. 2N and 2C
2. 2N and 4C
3. 4N and 2C
4. 4N and 4C

50 Identify the stage of mitosis shown in the given diagram:

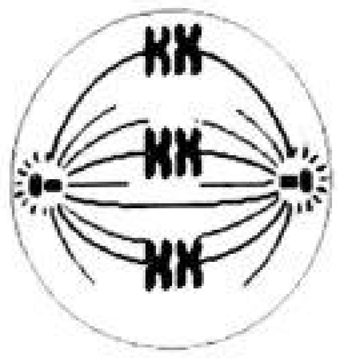
<table><tr><td></td><td><table><tr><td>1. Prophase</td><td>2. Metaphase</td></tr><tr><td>3. Anaphase</td><td>4. Telophase</td></tr></table></td></tr></table>

51 The given diagram shows the cell undergoing mitosis at:

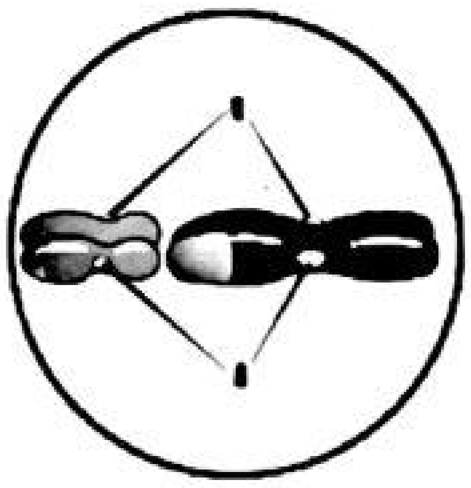


1.	telophase	2.	metaphase
3.	prophase	4.	anaphase

52 The cell shown in the given diagram is in:

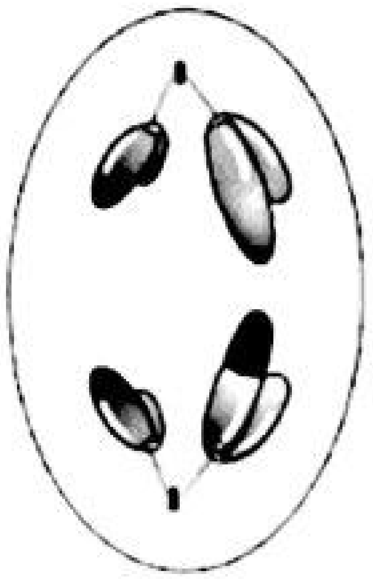
<table><tr><td></td><td><table><tr><td>1. Metaphase I</td><td>2. Metaphase II</td></tr><tr><td>3. Anaphase I</td><td>4. Anaphase II</td></tr></table></td></tr></table>

53 The cell shown in the given figure is most likely at:



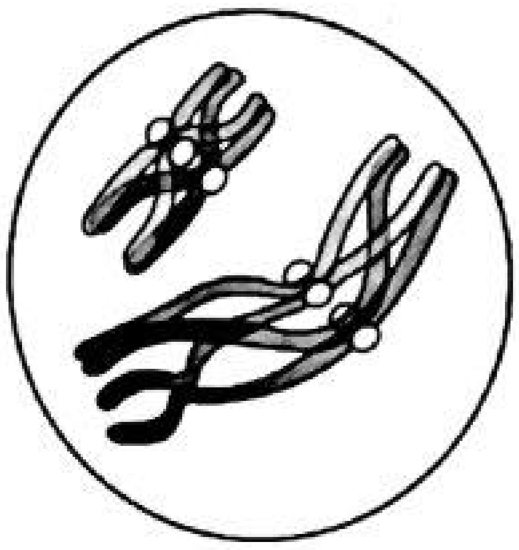
1. Metaphase I
2. Metaphase II
3. Anaphase I
4. Anaphase II

54 The cell shown in the given figure is most likely at:



1. Metaphase I
2. Metaphase II
3. Anaphase I
4. Anaphase II

55 The cell shown in the given figure is most likely at:



1. Prophase II
2. Prophase I
3. Anaphase I
4. Anaphase II

SIGNIFICANCE OF MITOSIS

56 All the following are significances of mitosis except:

1. Restoration of nuclear/cytoplasmic ratio
2. Growth of living organisms
3. Replacement of lost cells
4. Generation of genetic variation

57 Males produce gametes by mitosis in:

1.	Honey bees	2.	Grasshopper
3.	Birds	4.	*Drosophila melanogaster*

58 Consider the following two statements:

I:	The growth of multi-cellular organisms is due to mitosis.
II:	Mitosis results in the production of diploid daughter cells with identical genetic complement usually.

Of the two statements:

1. Both **I** and **II** are correct and **II** explains **I**
2. Both **I** and **II** are correct but **II** does not explain **I**
3. **I** is correct but **II** is incorrect
4. **I** is incorrect but **II** is correct

MEIOSIS

59 In meiosis:

1.	A single round of DNA replication is followed by two sequential divisions with chromosome number and DNA content getting reduced twice
2.	A single round of DNA replication is followed by two sequential divisions with chromosome number getting reduced twice and DNA content getting reduced once
3.	A single round of DNA replication is followed by two sequential divisions with chromosome number getting reduced once and DNA content getting reduced twice
4.	A single round of DNA replication is followed by two sequential divisions with chromosome number and DNA content getting reduced once

60 Meiosis results in the formation of:

1. Two genetically identical diploid cells
2. Two genetically non identical diploid cells
3. Four genetically identical haploid cells
4. Four genetically non identical haploid cells

61 Consider the two statements:

Assertion (A):	Meiosis ensures the production of haploid phase in the life cycle of sexually reproducing organisms.
Reason (R):	Syngamy restores the diploid condition in sexually reproducing organisms.

1.	**(A)** is true; **(R)** is False
2.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**
3.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**
4.	**(A)** is False; **(R)** is True

62 All the following are key features of meiosis except:

1.	Meiosis involves two sequential cycles of nuclear and cell division called meiosis I and meiosis II but only a single cycle of DNA replication.
2.	Meiosis I is initiated after the parental chromosomes have replicated to produce identical sister chromatids at the S phase.
3.	Meiosis involves pairing of homologous chromosomes and recombination between non-sister chromatids of homologous chromosomes.
4.	Four haploid cells are formed at the end of meiosis I.

63 Identify the correct statements regarding Meiosis:

I:	Meiosis involves two sequential cycles of nuclear and cell division called meiosis I and meiosis II but only a single cycle of DNA replication.
II:	Meiosis I is initiated after the parental chromosomes have replicated to produce identical sister chromatids at the S phase and the daughter cells of meiosis I replicate DNA during interkinesis.
III:	Meiosis involves pairing of heterologous chromosomes and recombination between sister chromatids of homologous chromosomes.
IV:	Four haploid cells are formed at the end of meiosis II.

1. **I** and **II** only
2. **III** and **IV** only
3. **I** and **IV** only
4. **II** and **III** only

64 Prophase I has been subdivided into the five phases based on chromosomal behaviour and the correct chronology of these phases [beginning from the earliest] will be:

1.	Leptotene, Zygotene, Pachytene, Diakinesis and Diplotene.
2.	Leptotene, Zygotene, Pachytene, Diplotene and Diakinesis.
3.	Leptotene, Pachytene, Zygotene, Diakinesis and Diplotene.
4.	Diplotene, Zygotene, Pachytene, Diakinesis and Leptotene.

65 Synapsis occurs between

1. mRNA and ribosomes
2. Spindle fibers and centromere
3. Two homologous chromosomes
4. A male and a female gamete

66 A ribbon-like structure consisting of three protein components and extending across the region of synapsed chromosomes during the prophase of meiosis, is called:

1.	Phragmoplast	2.	Phragmosome
3.	Synaptonemal complex	4.	Recombination nodule

67 What is incorrect regarding the second stage of prophase I?

1.	It is called Zygotene.
2.	Chromosomes start pairing together and this process of association is called synapsis.
3.	Such paired chromosomes are called heterologous chromosomes.
4.	Chromosome synapsis is accompanied by the formation of complex structure called synaptonemal complex.

68 In meiosis:

I:	paired chromosomes are called homologous chromosomes.
II:	Chromosome synapsis is accompanied by the formation of complex structure called synaptonemal complex.
III:	The complex formed by a pair of synapsed homologous chromosomes is called a bivalent or a tetrad.
IV:	Tetrads are most clearly visible during zygotene.

1. Only **I, II** and **III** are correct
2. Only **I, III** and **IV** are correct
3. Only **II, III** and **IV** are correct
4. **I, II, III** and **IV** are correct

69 The complex formed by a pair of synapsed homologous chromosomes is called

1.	Equatorial plate	2.	Kinetochore
3.	Bivalent	4.	Axoneme

70 The enzyme recombinase is required at which stage of meiosis ?

1.	Pachytene	2.	Zygotene
3.	Diplotene	4.	Diakinesis

71 In meiosis crossing over is initiated at

1.	Pachytene	2.	Leptotene
3.	Zygotene	4.	Diplotene

72 During meiosis, the bivalent chromosomes clearly appear as tetrads first at:

1.	Zygotene of Prophase I	2.	Pachytene of Prophase I
3.	Metaphase I	4.	Anaphase I

73 During prophase I of meiosis I, recombination between homologous chromosomes is completed:

1. in the Zygotene
2. in the beginning of the Pachytene
3. by the end of Pachytene
4. in the beginning of the Diplotene

74 During pachytene of prophase I of meiosis I:

I:	the four chromatids of each bivalent chromosome become distinct and clearly appear as tetrads.
II:	there is the appearance of recombination nodules.
III:	crossing over occurs.

1. Only **I** and **II** are correct
2. Only **I** and **III** are correct
3. Only **II** and **III** are correct
4. **I, II** and **III** are correct

75 Crossing over:

I:	is the exchange of genetic material between two sister chromatids of heterologous chromosomes.
II:	is an enzyme-mediated process and the enzyme involved is called recombinase.
III:	leads to recombination of genetic material on the two chromosomes.
IV:	is completed by the end of pachytene, leaving the chromosomes linked at the sites of crossing over.

1. Only **I, II** and **III** are correct
2. Only **I, III** and **IV** are correct
3. Only **II, III** and **IV** are correct
4. **I, II, III** and **IV** are correct

76 Which of the following stages of Prophase I of meiosis I can last for many months or years in certain vertebrate oocytes?

1.	Zygotene	2.	Pachytene
3.	Diplotene	4.	Diakinesis

77 The beginning of diplotene is recognized by:

I:	dissolution of the synaptonemal complex
II:	the tendency of recombined homologues of bivalents to separate
III:	tetrads becoming clearly visible

1.	Only **I** and **II**	2.	Only **I** and **III**
3.	Only **II** and **III**	4.	**I, II,** and **III**

78 X-shaped structures, called chiasmata, are visible during:

1. Zygotene of prophase I
2. Pachytene of prophase I
3. Diplotene of prophase I
4. Diakinesis of prophase I

79 The point of contact between paired chromatids during meiosis, resulting in a cross-shaped configuration and representing the cytological manifestation of crossing over is called:

1.	Centromere	2.	Centrosome
3.	Chiasmata	4.	Tetrad

80 Large protein complexes on the synaptonemal complex between two synapsed homologous chromosomes are called as:

1.	Kinetochore	2.	Chiasmata
3.	Recombination nodules	4.	Telomeres

81 Identify the incorrect statement regarding diakinesis of prophase I of meiosis I:

1.	It is the final stage of meiotic prophase I.
2.	It is marked by terminalisation of chiasmata.
3.	During this phase, the meiotic spindle is assembled to prepare the homologous chromosomes for separation.
4.	By the end of diakinesis, the nucleolus reappears and the nuclear envelope also reappears.

82 What occurs during diakinesis, the final stage of prophase I in meiosis?

1.	Tetrads align at the cell's equator.
2.	Crossing over between homologous chromosomes.
3.	Chromosomal condensation is nearly completed, and tetrads prepare for attachment to the spindle.
4.	Nuclear envelope re-forms and the cell prepares for cytokinesis.

83 Match the following with respect to meiosis:

(a)	Zygotene	(i)	Terminalization
(b)	Pachytene	(ii)	Chiasmata
(c)	Diplotene	(iii)	Crossing over
(d)	Diakinesis	(iv)	Synapsis

Select the correct option from the following:

	(a)	(b)	(c)	(d)
1.	(iv)	(iii)	(ii)	(i)
2.	(i)	(ii)	(iv)	(iii)
3.	(ii)	(iv)	(iii)	(i)
4.	(iii)	(iv)	(i)	(ii)

84 Consider the following statements regarding meiosis:

I:	At metaphase I, the microtubules from the opposite poles of the spindle attach to the pair of homologous chromosomes.
II:	At anaphase I, the homologous chromosomes separate, while sister chromatids remain associated with each other.

Of the two statements:

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

85 Consider the given two statements:

Statement I:	At Metaphase I the chromosomes align at the equator and the microtubules from opposite poles of the spindle get attached to the kinetochores of sister chromatids.
Statement II:	At metaphase II the bivalent chromosomes align on the equatorial plate and microtubules from the opposite poles of the spindle attach to the kinetochore of homologous chromosomes.

1.	**Statement I** is correct and **Statement II** is incorrect.
2.	**Statement I** is incorrect and **Statement II** is incorrect.
3.	**Statement I** is correct and **Statement II** is correct.
4.	**Statement I** is incorrect and **Statement II** is correct.

86 During Metaphase I:

I:	The bivalent chromosomes align on the equatorial plate.
II:	The microtubules from the opposite poles of the spindle attach to the kinetochore of homologous chromosomes.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

87 Independent assortment occurs in eukaryotic organisms during meiotic:

1. Metaphase I
2. Metaphase II
3. Anaphase I
4. Anaphase II

88 During anaphase I of meiosis I:

1.	The homologous chromosomes separate, while sister chromatids remain associated at their centromeres.
2.	Simultaneous splitting of the centromere of each chromosome allows the sister chromatids to move towards opposite poles of the cell.
3.	The nucleolus disappears and the nuclear envelope also breaks down.
4.	the centrosome in animal cells undergoes replication.

89 During anaphase I of meiosis

1. Homologous chromosomes separate
2. Non-homologous autosomes separate
3. Sister chromatids separate
4. Non-sister chromatids separate

90 Regarding anaphase I:

Statement I:	The homologous chromosomes separate, while sister chromatids remain associated at their centromeres.
Statement II:	It is the basis of segregation.

1.	**Statement I** is correct and **Statement II** is incorrect.
2.	**Statement I** is incorrect and **Statement II** is incorrect.
3.	**Statement I** is correct and **Statement II** is correct.
4.	**Statement I** is incorrect and **Statement II** is correct.

91 In meiotic cell division, the simultaneous splitting of the centromere of each chromosome allowing sister chromatids to move toward opposite poles of the cell by shortening of microtubules attached to kinetochores, occurs during:

1. Metaphase I
2. Metaphase II
3. Anaphase I
4. Anaphase II

92 In telophase I:

Statement I:	The nuclear membrane and nucleolus reappear.
Statement II:	The chromosomes reach the extremely extended state of the interphase nucleus.

1.	**Statement I** is correct and **Statement II** is incorrect.
2.	**Statement I** is incorrect and **Statement II** is incorrect.
3.	**Statement I** is correct and **Statement II** is correct.
4.	**Statement I** is incorrect and **Statement II** is correct.

93 The stage of meiosis I, characterised by the following events, is:

I: The nuclear membrane and nucleolus reappear.
II: Some dispersion of chromosomes.

1. Prophase I
2. Metaphase I
3. Anaphase I
4. Telophase I

94 During which stage of prophase I of meiosis I, the four chromatids of each of the bivalent chromosomes become distinct and clearly appear as tetrads?

1.	Leptotene	2.	Zygotene
3.	Pachytene	4.	Diplotene

95 Consider the given two statements:

Assertion (A):	Meiosis I is a reductional division.
Reason (R):	There is no DNA replication during interkinesis.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
3.	**(A)** is True but **(R)** is False
4.	Both **(A)** and **(R)** are False

96 Which of the following stages of meiosis is not correctly matched with the event of cell division?

1.	Metaphase I	Bivalent alignment on the equatorial plate
2.	Anaphase I	Splitting of centromere
3.	Prophase II	Nuclear membrane disappears by the end
4.	Metaphase II	Microtubules from the opposite poles of the spindle get attached to the kinetochores of sister chromatids

97 At metaphase II:

I:	the chromosomes align at the equator.
II:	the microtubules from opposite poles of the spindle get attached to the kinetochores of sister chromatids.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

98 In meiosis, the splitting of the centromere of each chromosome takes place during:

1.	Metaphase I	2.	Metaphase II
3.	Anaphase I	4.	Anaphase II

99 Separation of homologous chromosomes during meiosis occurs at:

1. Anaphase I of meiosis I
2. Anaphase II of meiosis II
3. Metaphase I of meiosis I
4. Metaphase II of meiosis II

100 Regarding anaphase I and anaphase II of meiosis, which statement is accurate?

1.	Homologous chromosomes separate in anaphase I, while sister chromatids separate in anaphase II.
2.	Sister chromatids separate in anaphase I, while homologous chromosomes separate in anaphase II.
3.	Both homologous chromosomes and sister chromatids separate in anaphase I.
4.	No separation occurs in anaphase II.

101 Identify the stage of meiotic cell division, which is followed by cytokinesis, leading to the formation of a dyad of cells:

1. Anaphase I
2. Telophase I
3. Anaphase II
4. Telophase II

SIGNIFICANCE OF MEIOSIS

102 The mechanisms that contribute to the genetic variation arising from sexual reproduction include:

I:	Independent assortment of chromosomes
II:	Crossing over
III:	Random fertilization

1.	**I** and **II** only	2.	**I** and **III** only
3.	**II** and **III** only	4.	**I, II** and **III**

103 Which of the following are important significances of meiosis?

I:	It ensures conservation of specific chromosome number of each species across generations in sexually reproducing organisms.
II:	It increases the genetic variability in the population of organisms from one generation to the next.

1. Only **I**
2. Only **II**
3. Both **I** and **II**
4. Neither **I** nor **II**

104 The most important significance of meiosis is that:

1. It increases variations in the gene pool of the species that helps in evolution of that species.
2. It causes growth in the multicellular organisms.
3. It conserves specific number of chromosomes in each species across generations.
4. It is vital for repair and regeneration functions in the living organisms.

105 Consider the given two statements:

I: Meiosis is responsible for maintaining the chromosome number across generations in sexually reproducing organisms.

II: Meiosis results in reduction of chromosome number by half in the daughter cells.

1. Both **I** and **II** are correct and **II** explains **I**
2. Both **I** and **II** are correct but **II** does not explain **I**
3. **I** is correct but **II** is incorrect
4. **I** is incorrect but **II** is correct

CELL CYCLE AND CELL DIVISION - ANSWER KEY

1.	**(3)**	2.	**(3)**	3.	**(1)**	4.	**(2)**	5.	**(3)**	6.	**(4)**	7.	**(1)**	8.	**(2)**	9.	**(3)**	10.	**(3)**
11.	**(2)**	12.	**(3)**	13.	**(3)**	14.	**(3)**	15.	**(4)**	16.	**(3)**	17.	**(3)**	18.	**(1)**	19.	**(1)**	20.	**(4)**
21.	**(2)**	22.	**(3)**	23.	**(4)**	24.	**(3)**	25.	**(1)**	26.	**(3)**	27.	**(3)**	28.	**(4)**	29.	**(1)**	30.	**(2)**
31.	**(3)**	32.	**(3)**	33.	**(2)**	34.	**(4)**	35.	**(3)**	36.	**(3)**	37.	**(4)**	38.	**(2)**	39.	**(4)**	40.	**(4)**
41.	**(4)**	42.	**(3)**	43.	**(1)**	44.	**(2)**	45.	**(1)**	46.	**(1)**	47.	**(4)**	48.	**(3)**	49.	**(4)**	50.	**(3)**
51.	**(1)**	52.	**(1)**	53.	**(2)**	54.	**(4)**	55.	**(2)**	56.	**(4)**	57.	**(1)**	58.	**(2)**	59.	**(3)**	60.	**(4)**
61.	**(3)**	62.	**(4)**	63.	**(3)**	64.	**(2)**	65.	**(3)**	66.	**(3)**	67.	**(3)**	68.	**(1)**	69.	**(3)**	70.	**(1)**
71.	**(1)**	72.	**(2)**	73.	**(3)**	74.	**(4)**	75.	**(3)**	76.	**(3)**	77.	**(1)**	78.	**(3)**	79.	**(3)**	80.	**(3)**
81.	**(4)**	82.	**(3)**	83.	**(1)**	84.	**(3)**	85.	**(2)**	86.	**(3)**	87.	**(1)**	88.	**(1)**	89.	**(1)**	90.	**(3)**
91.	**(4)**	92.	**(1)**	93.	**(4)**	94.	**(3)**	95.	**(2)**	96.	**(2)**	97.	**(3)**	98.	**(4)**	99.	**(1)**	100.	**(1)**
101.	**(2)**	102.	**(4)**	103.	**(3)**	104.	**(3)**	105.	**(1)**										

HOW TO ANALYSE CHEMICAL COMPOSITION?

1 Most common element present in human body is:

1.	Oxygen	2.	Carbon
3.	Hydrogen	4.	Sulfur

2 When we homogenize any tissues in an acid the acid soluble pool represents

1.	Cytoplasm	2.	Cell membrane
3.	Nucleus	4.	Mitochondria

3 Identify the correct statement:

1.	α amino acids are substituted methanes
2.	Only triglycerides are lipids that are both macromolecules as well as polymers
3.	Cellulose forms secondary helical structures and can hold iodine molecules in the helical portion
4.	Every virus will have both DNA and RNA as its genetic material

4 The unique properties of each amino acid is determined by its particular:

1. R group
2. amino group
3. kinds of peptide bond
4. number of bonds to other amino acids

5 The simplest α amino acid is:

1. Glycine	2. Alanine
3. Serine	4. Lysine

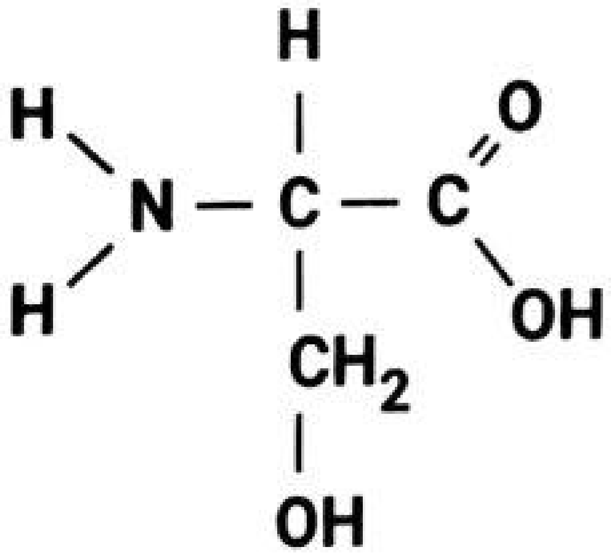
6 Which of the following is not an aromatic amino acid?

1. Phenylalanine	2. Threonine
3. Tyrosine	4. Tryptophan

7 All the following are examples of basic amino acids except:

1.	Lysine	2.	Histidine
3.	Arginine	4.	Valine

8 Identify the amino acid shown in the given figure:

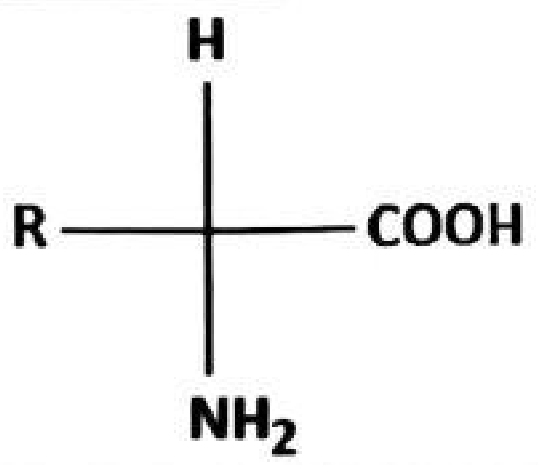
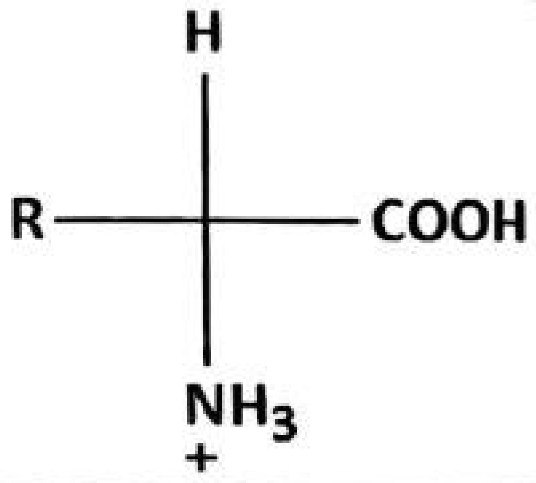
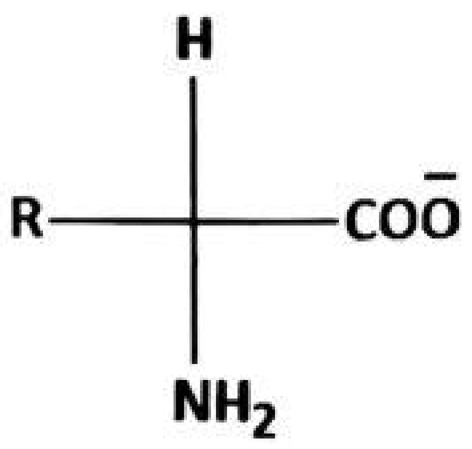
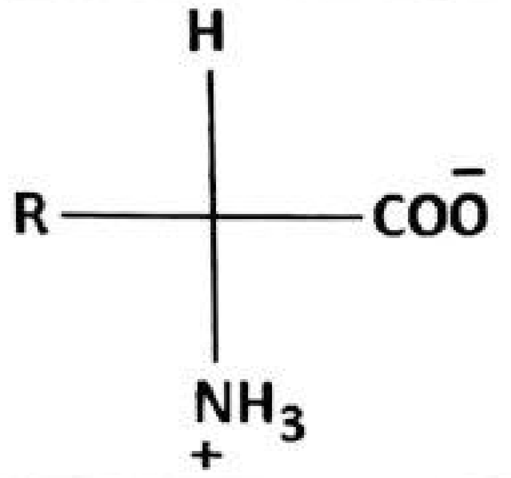


1.	Glycine	2.	Alanine
3.	Serine	4.	Lysine

9 At physiological pH, the amino acid exists as a zwitter ion because:

1.	It has no net charge.
2.	It has a positive and a negative charge at different parts of the molecule.
3.	It can donate a proton to the surrounding medium.
4.	It can accept a proton from the surrounding medium.

10 Which of the following is a zwitter ion?

1.		2.	
3.		4.	

11 Consider the given two statements:

Assertion (A):	In solutions of different pH, the structure of amino acids changes.
Reason (R):	A particular property of amino acids is the ionizable nature of $-NH_2$ and $-COOH$ groups.

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	**(A)** is True but **(R)** is False.
3.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
4.	**(A)** is False but **(R)** is True.

12 Which statement about lipids is correct?

1.	Lipids are primarily polar and hydrophilic.
2.	Lipids are polymers of amino acids.
3.	Lipids are generally insoluble in water but soluble in organic solvents.
4.	Lipids are made of glycerol and three phosphate groups.

13 Consider the two statements:

Statement I:	Palmitic acid has 16 carbons including carboxyl carbon.
Statement II:	Arachidonic acid has 20 carbon atoms including the carboxyl carbon.

1. **Statement I** is correct; **Statement II** is incorrect
2. **Statement I** is incorrect; **Statement II** is correct
3. **Statement I** is correct; **Statement II** is correct
4. **Statement I** is incorrect; **Statement II** is incorrect

14 Identify the incorrect statement:

1.	Lipids are generally water insoluble.
2.	Fatty acids could be saturated (without double bond) or unsaturated (with one or more C=C double bonds).
3.	Glycerol is trihydroxy propane.
4.	No lipids have both glycerol and fatty acids.

15 Which of the following organic compounds is the main constituent of Lecithin?

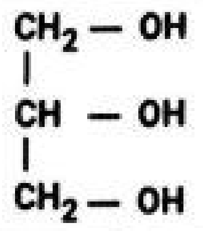
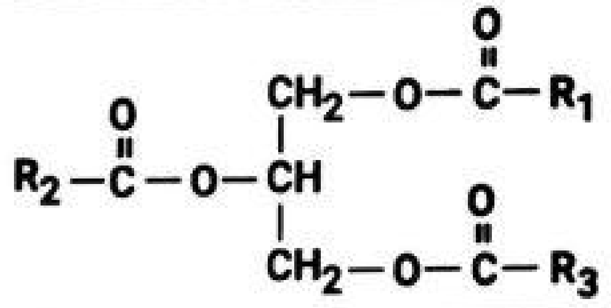
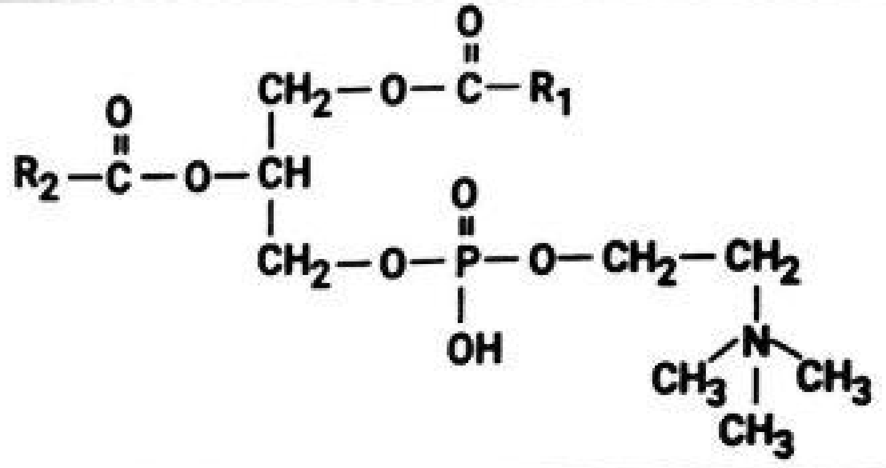
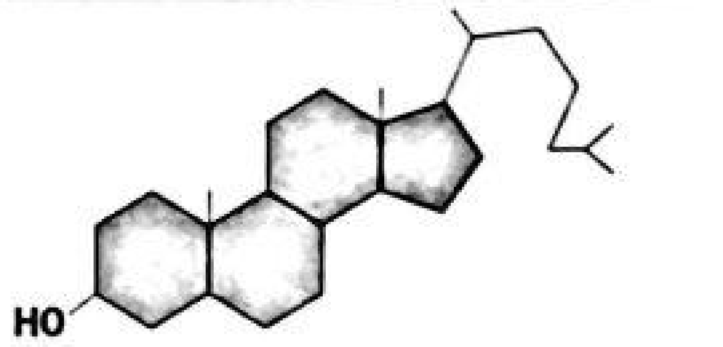
1.	Arachidonic acid	2.	Phospholipid
3.	Cholesterol	4.	Phosphoprotein

16 Consider the given two statements:

I:	Gingelly oil remains as oil in winters.
II:	The fatty acid components of the oil are all saturated.

1.	Both **I** and **II** are correct and **II** correctly explains **I**
2.	Both **I** and **II** are correct but **II** does not correctly explain **I**
3.	**I** is correct but **II** is incorrect
4.	**I** is incorrect but **II** is correct

17 Which of the following given molecules will be a structural component of the cell membrane in an animal cell?

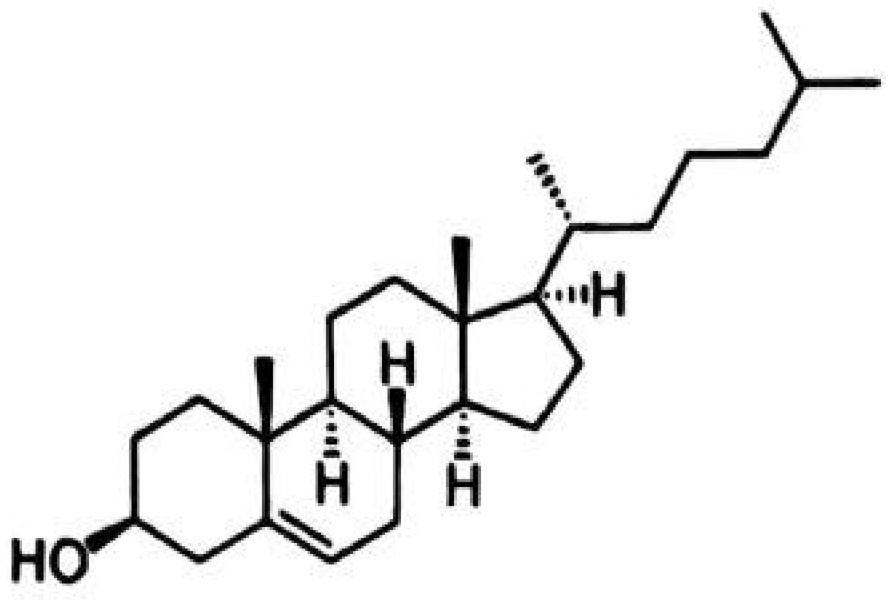
I:	
II:	
III:	
IV:	

1.	Only **I** and **II**	2.	Only **I** and **III**
3.	Only **III** and **IV**	4.	**I, II, III** and **IV**

18 If the R group in a proteinaceous amino acid is called hydroxy methyl, the amino acid must be:

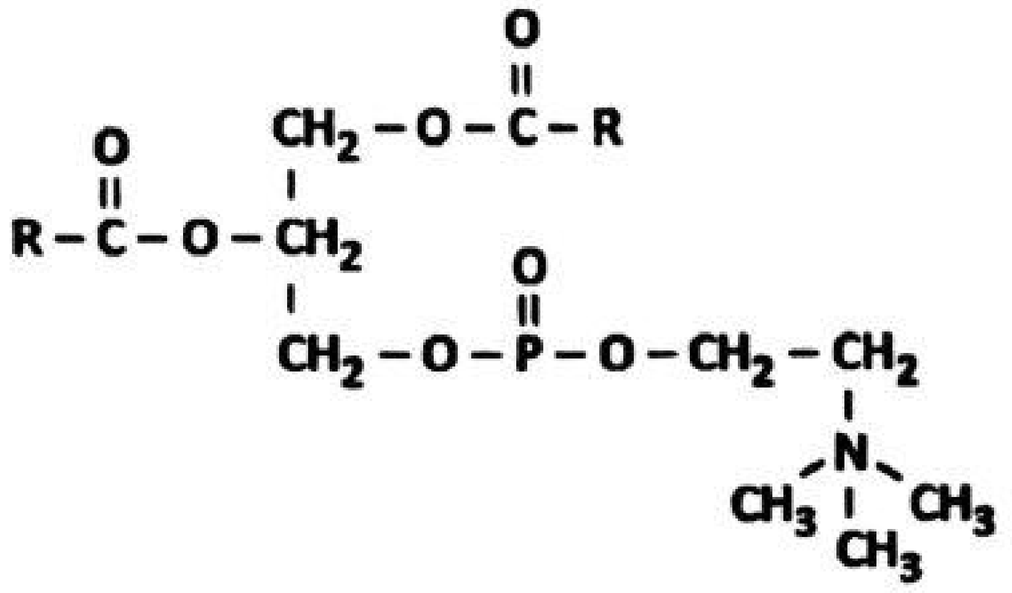
1. phenylalanine
2. serine
3. alanine
4. tyrosine

19 Identify the given molecule:



1. Cholesterol
2. Phospholipid
3. Triglyceride
4. Fatty acid

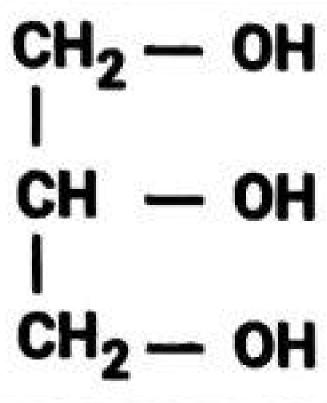
20 The molecule shown below is a/an:



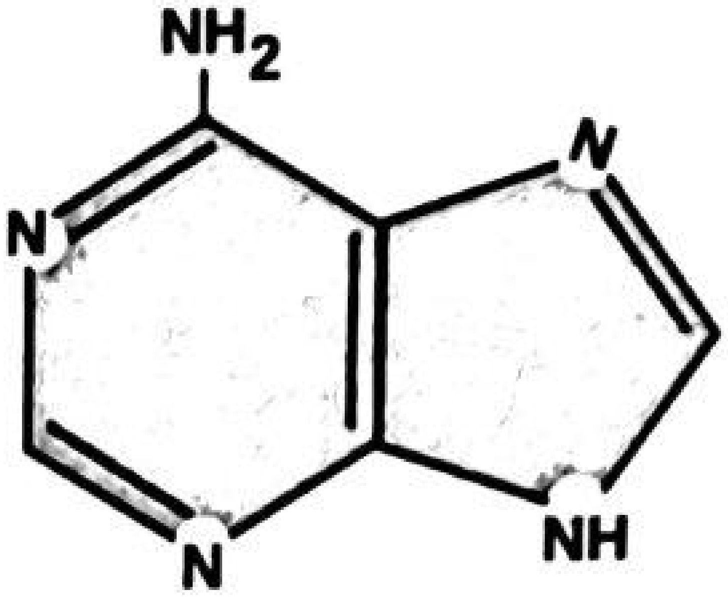
$$\begin{array}{l} R-\overset{O}{\overset{\|}{C}}-O-CH_2 \quad CH_2-O-\overset{O}{\overset{\|}{C}}-R \\ \qquad\qquad CH_2-O-\overset{O}{\overset{\|}{P}}-O-CH_2-CH_2-N(CH_3)_3 \end{array}$$

1. Amino acid
2. Lipid
3. Polysaccharide
4. Protein

21 Identify the lipid shown in the given figure:

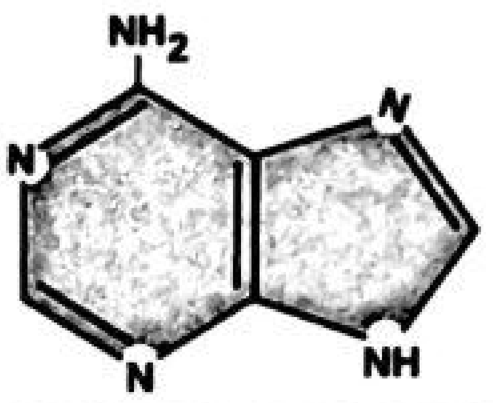
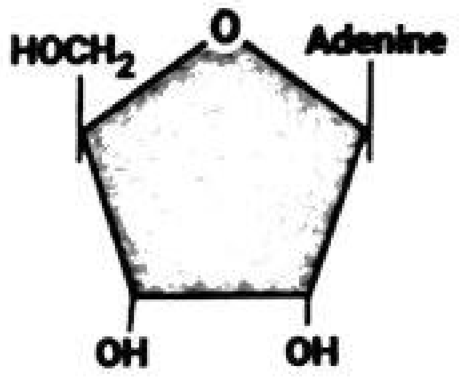
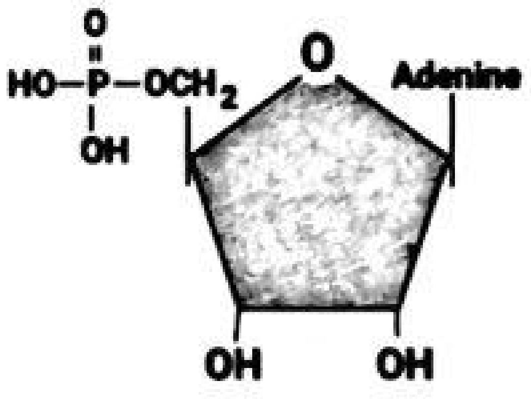
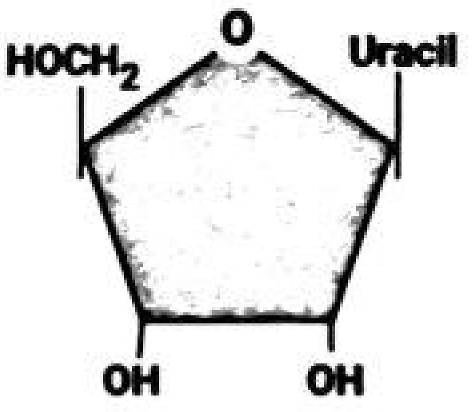
1. Glycerol 2. Fatty acid 3. Sphingosine 4. Cerebroside	 $\begin{array}{l} CH_2-OH \\ \vert \\ CH-OH \\ \vert \\ CH_2-OH \end{array}$

22 Identify the given nitrogenous base:



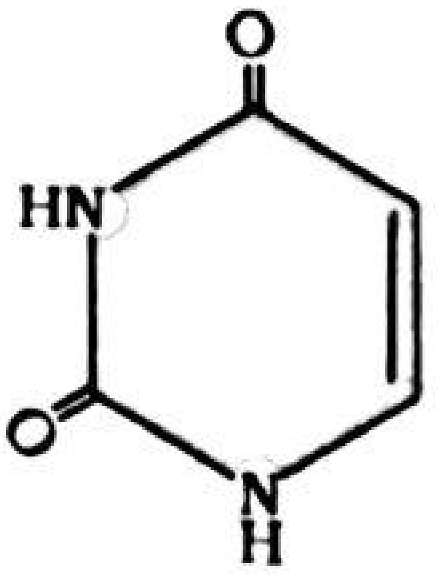
1.	Adenine	2.	Guanine
3.	Thymine	4.	Cytosine

23 Which of the following is the correct structure of a monomer present in the structure of a DNA molecule?

1.		2.	
3.		4.	

NH2
N
N
N
NH
HOCH2
O
Adenine
OH
OH
HO-P-OCH2
OH
O
Adenine
OH
OH
HOCH2
O
Uracil
OH
OH

24 The molecule shown in the given figure:



1. is a substituted purine found in DNA
2. is a substituted purine found in RNA
3. is a substituted pyrimidine found in DNA
4. is a substituted pyrimidine found in RNA

25 What are thymidine, uridine, and cytidine?

1. Purines
2. Pyrimidines
3. Nucleosides
4. Nucleotides

26 If the % weight of elements in Earth's crust and human body are compared, all the following will have a higher % composition in human body except:

1. Carbon
2. Oxygen
3. Nitrogen
4. Calcium

PRIMARY AND SECONDARY METABOLITES

27 Which of the following is not an example of a secondary metabolite produced in living organisms?

1.	Lecithin	2.	Alkaloids
3.	Flavonoids	4.	Antibiotics

28 Match each item in Column I with one item in Column II and chose your answer from the codes given below:

Column I		**Column II**	
(a)	Alkaloid	(i)	Abrin
(b)	Toxin	(ii)	Morphine
(c)	Lectin	(iii)	Vinblastin
(d)	Drug	(iv)	Concanavalin A

	(a)	(b)	(c)	(d)
1.	(i)	(ii)	(iii)	(iv)
2.	(ii)	(i)	(iv)	(iii)
3.	(ii)	(i)	(iii)	(iv)
4.	(i)	(ii)	(iv)	(iii)

29 Consider the given two statements:

Statement I:	Secondary metabolites derived from plant, fungal and microbial cells do not have a use in human welfare.
Statement II:	We do not, at the moment, understand the role or functions of all the secondary metabolites in host organisms.

1.	Both **Statement I** and **Statement II** are correct and **Statement II** correctly explains **Statement I**
2.	Both **Statement I** and **Statement II** are correct but **Statement II** does not correctly explain **Statement I**
3.	**Statement I** is correct but **Statement II** is incorrect
4.	**Statement I** is incorrect but **Statement II** is correct

30 Which of the secondary metabolites is an important anti-cancer drug?

1.	Ricin	2.	Abrin
3.	Vincristine	4.	Atropine

31 Match each item in Column I with one in Column II and select the correct match from the codes given:

	Secondary metabolites		Class
A.	Vinblastine	P.	Polymeric substances
B.	Concanavalin A	Q.	Drugs
C.	Rubber	R.	Toxins
D.	Ricin	S.	Lectins

Codes:

	A	B	C	D
1.	R	S	P	Q
2.	Q	S	P	R
3.	Q	P	R	S
4.	P	Q	R	S

32 All the following will be secondary metabolites synthesised by living organisms, except:

1. flavonoids
2. antibiotics
3. starch
4. gums

33

Assertion (A):	Secondary metabolites in plants do not play any roles in the plant bodies.
Reason (R):	All secondary metabolites are excretory products in plants.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	Both **(A)** and **(R)** are True and **(R)** does not correctly explain **(A)**.
3.	**(A)** is True; **(R)** is False
4.	Both **(A)** and **(R)** are False

34 Match the following secondary metabolites with their examples as given in the table of NCERT:

	Column A		Column B
1.	Alkaloids	A.	Tannins
2.	Terpenoids	B.	Rubber
3.	Polyphenols	C.	Caffeine

Options:

1. 1-A, 2-B, 3-C
2. 1-C, 2-A, 3-B
3. 1-B, 2-C, 3-A
4. 1-C, 2-B, 3-A

35 Which of the following best describes the role of secondary metabolites in plants?

1.	They are primarily involved in growth and development.
2.	They are essential for the plant's primary metabolic processes.
3.	They play a key role in the plant's defense mechanisms.
4.	They are directly involved in photosynthesis.

BIOMACROMOLECULES

36 The true macromolecular fraction of any living tissue or cell includes all the following except:

1. polynucleotides
2. lipids
3. polysaccharides
4. polypeptides

37 The molecules in the acid insoluble fraction of a cell:

1.	have molecular weights ranging from 18 to around 800 daltons (Da) approximately.
2.	include lipids.
3.	are all polymeric substances.
4.	correspond to the cytoplasm of a typical cell.

38 Consider the given two statements:

Assertion (A):	Lipids are not considered macromolecules.
Reason (R):	Lipids are not polymers.

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**
3.	**(A)** is True but **(R)** is False
4.	**(A)** is False but **(R)** is True

39 If we represent the chemical composition of living tissue from abundance point of view and arrange them class-wise, the second most abundant chemical in living organisms is:

1. Water
2. Protein
3. Carbohydrate
4. Nucleic acid

40 Consider the given two statements:

Statement I:	Lipids are a part of acid insoluble fraction or the macromolecular fraction during chemical analysis of a cell.
Statement II:	Lipids have a molecular weight running in thousands of Dalton.

1.	Both **Statement I** and **Statement II** are correct and **Statement II** correctly explains **Statement I**
2.	Both **Statement I** and **Statement II** are correct but **Statement II** does not correctly explain **Statement I**
3.	**Statement I** is correct but **Statement II** is incorrect
4.	**Statement I** is incorrect but **Statement II** is correct

41 If we consider the average composition of cells the correct descending order of the components will be:

1. Proteins → Nucleic acids → Carbohydrates → Lipids
2. Proteins → Carbohydrates → Nucleic acids → Lipids
3. Lipids → Carbohydrates → Nucleic acids → Proteins
4. Carbohydrates → Proteins → Lipids → Nucleic acids

42 In a typical cell, which of the following constitutes least % of the total cellular mass?

1.	Proteins	2.	Nucleic acids
3.	Carbohydrates	4.	Lipids

43 Consider the given two statements:

I:	Lipids come under acid insoluble fraction.
II:	Lipids are macromolecules.

1.	Both **I** and **II** are correct and **II** explains **I**
2.	Both **I** and **II** are correct but **II** does not explain **I**
3.	**I** is correct but **II** is incorrect
4.	**I** is incorrect but **II** is correct

PROTEINS

44 Consider the given two statements:

Statement I:	A protein is a heteropolymer.
Statement II:	There are 20 types of proteinogenic amino acids and they are linked by peptide bonds to form polypeptides.

1. Only **Statement I** is correct
2. Only **Statement II** is correct
3. Both **Statement I** and **Statement II** are correct
4. Both **Statement I** and **Statement II** are incorrect

45 Consider the given two statements:

Statement 1:	Certain amino acids are essential for our health.
Statement 2:	Only such amino acids are used to make proteins in our body according to our own genetic code.

1.	Both **Statement 1** and **Statement 2** are correct and **Statement 2** correctly explains **Statement 1**
2.	Both **Statement 1** and **Statement 2** are correct but **Statement 2** does not correctly explain **Statement 1**
3.	**Statement 1** is correct but **Statement 2** is incorrect
4.	**Statement 1** is incorrect but **Statement 2** is correct

46 Identify the correctly matched pair/s:

I:	GLUT-4	Enables glucose transport out of the cells
II:	Collagen	Most abundant protein in animal world
III:	RuBisCO	Most abundant protein in the whole of the biosphere

1.	Only **I**	2.	Only **I** and **II**
3.	Only **I** and **III**	4.	Only **II** and **III**

47 Identify the incorrect statement:

1.	Each protein is a polymer of amino acids.
2.	A protein is a heteropolymer and not a homopolymer.
3.	Essential amino acids can be synthesized in our body.
4.	Collagen is the most abundant protein in animal world.

48 ________ is the most abundant protein in animal world and _________ is the most abundant protein in the whole of the biosphere.

1. Collagen, RuBisCO
2. RuBisCO, Collagen
3. Keratin, Collagen
4. Haemoglobin, RuBisCO

49 GLUT-4, that enables glucose transport into the cells, is a:

1. protein
2. amino acid
3. lipid
4. ribonucleoprotein

50 Consider the two statements:

I:	In a polypeptide or a protein, amino acids are linked by a peptide bond.
II:	In a polysaccharide, the individual monosaccharides are linked by a glycosidic bond.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

51 Which of the following is a heteropolymer?

1.	starch	2.	collagen
3.	cellulose	4.	glycogen

52 Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R):

Assertion (A):	Dietary proteins are the source of essential amino acids.
Reason (R):	All essential amino acids are aromatic.

In the light of the above statements, choose the correct answer from the options given below:

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	Both **(A)** and **(R)** are False.

POLYSACCHARIDES

53 The number of correct statement(s) from the statements given below is/are:

I:	Cellulose is a polymeric polysaccharide consisting of only one type of monosaccharide.
II:	Starch is a homopolymer.
III:	Inulin is a polymer of fructose.
IV:	In glycogen, the right end is called the reducing end, and the left end is called the non-reducing end.

1. 1
2. 2
3. 3
4. 4

54 Consider the given two statements:

Assertion:	The starch-I_2 is blue in colour.
Reason:	Starch forms helical secondary structures and can hold I_2 molecules in the helical portion.

1.	**(A)** is True but **(R)** is False.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is False but **(R)** is True.
4.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.

55 Match the polysaccharide with its correct function:

I.	Starch	- Storage of glucose in plants
II.	Glycogen	- Storage of glucose in animals
III.	Cellulose	- Structural component of plant cell walls
IV.	Chitin	- Structural component in fungal cell walls and exoskeletons of insects

1. Only **I, II** and **III**
2. Only **I, III** and **IV**
3. Only **II, III** and **IV**
4. **I, II, III** and **IV**

56 Consider the given two statements:

Assertion (A):	Glycogen has one reducing end.
Reason (R):	The reducing end is where non-reducing sugars can be added to the glycogen molecule.

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	Both **(A)** and **(R)** are False.

57 Which of the following is not a characteristic feature of carbohydrates?

1.	Most carbohydrates function primarily as structural components in cell walls.
2.	They serve as energy stores, fuels, and metabolic intermediates.
3.	Carbohydrates are commonly found as steroids and hormones in organisms.
4.	They are involved in cell recognition and signalling processes.

58 Regarding polysaccharides:

I:	Cellulose does not contain complex helices.
II:	Inulin is a polymer of fructose.
III:	Left end of glycogen is the reducing end

1. Only **I** and **II** are correct
2. Only **I** and **III** are correct
3. Only **II** and **III** are correct
4. **I, II** and **III** are correct

59 Chitin, a complex polysaccharide, is found in:

1.	Plant cell wall
2.	The exoskeleton of arthropods and cell walls of most fungi
3.	Bacterial cell wall
4.	Cartilage and other connective tissues

60 Identify the correct statements:

a:	Plant cell walls are made of cellulose.
b:	Fungal cell walls are made of chitin.
c:	True bacterial cell walls are made of lipopolysaccharides.
d:	Archaeal cell walls are made of sporopollenin.

1. Only **a** and **b**
2. Only **a** and **c**
3. Only **b** and **c**
4. Only **c** and **d**

61 Chitin:

I:	is a long-chain polymer of N-acetylglucosamine.
II:	is a primary component of cell walls in fungi.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

NUCLEIC ACIDS

62 Nucleic Acids:

I:	are polynucleotides.
II:	are constituents of the true macromolecular fraction of any living tissue or cell.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

63 Which of the following is not a component of a nucleotide?

1. Phosphate group
2. Ribose sugar
3. Fatty acid
4. Nitrogenous base

64 A pyrimidine found uniquely in DNA is:

1.	Uracil	2.	Thymine
3.	Cytosine	4.	Guanine

65 Identify the purine nitrogenous bases found in nucleic acids:

1. uracil and thymine
2. cytosine and guanine
3. thymine and cytosine
4. adenine and guanine

66 Identify the correct statements

Statement I:	Adenine and Guanine are substituted pyrimidines
Statement II:	Cytosine, Thymine and Uridine are substituted purines

1.	**Statement I** is correct and **Statement II** is incorrect
2.	**Statement I** is incorrect and **Statement II** is correct
3.	Both **Statement I** and **Statement II** are correct
4.	Both **Statement I** and **Statement II** are incorrect

STRUCTURE OF PROTEINS

67 Regarding the primary structure of a protein:

I:	The sequence of amino acids i.e., the positional information in a protein is called the primary structure of a protein.
II:	A protein is imagined as a line, the left end represented by the first amino acid and the right end represented by the last amino acid.
III:	The first amino acid is also called as C-terminal amino acid and the last amino acid is called the N-terminal amino acid.

1. Only **I** and **II** are correct
2. Only **I** and **III** are correct
3. Only **II** and **III** are correct
4. **I**, **II** and **III** are correct

68 Identify the correct statements:

I:	The level of protein structure organization that provides the positional information of amino acids in a protein is called as the primary structure.
II:	Only right handed helices are observed in proteins seen in living organisms.
III:	Tertiary structure is absolutely necessary for the many biological activities of proteins.

1.	Only **I** and **II**	2.	Only **I** and **III**
3.	Only **II** and **III**	4.	**I**, **II** and **III**

69 An alpha helix is a:

1. primary structure of a protein
2. secondary structure of a protein
3. tertiary structure of a protein
4. quaternary structure of a protein

70 Regarding various levels of protein structure, which of the following is not true?

1.	The positional information of amino acids in a protein is called the primary structure.
2.	Alpha helix is a secondary structure and beta pleated sheet is a tertiary structure of a protein.
3.	Tertiary structure is absolutely necessary for the many biological activities of proteins.
4.	Quaternary structures are seen in proteins made of more than one polypeptide chain.

71 A pure protein should normally have

1.	Two ends	2.	One end
3.	Three ends	4.	No ends

72 The number of types of units present in the structure of adult human hemoglobin is/are:

1. 1
2. 2
3. 3
4. 4

73 Adult human haemoglobin consists of:

I: 4 subunits.
II: 4 types of subunits.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

74 What level of protein organization structure explains the 3-D shape of an enzyme?

1. primary structure	2. tertiary structure
3. secondary structure	4. quaternary structure

ENZYMES

75 Almost all enzymes are:

1. Polysaccharides	2. Proteins
3. Nucleic acids	4. Lipids

76 Like a protein, an enzyme, almost always:

I: has a primary structure
II: has the secondary and the tertiary structure

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

77 The number of correct statement(s) from the given statements is/are:

I:	Almost all enzymes are proteins.
II:	Some nucleic acids can behave like enzymes.
III:	No enzyme in living organisms can function above 40 °C.
IV:	Enzymes are the reason that chemicals react with each other.
V:	Enzymes are not sensitive to pH in their environment.

1. 2
2. 3
3. 4
4. 5

78 A crevice or pocket into which the substrate fits forms the:

1. tertiary structure of an enzyme.
2. active site of an enzyme.
3. tertiary structure of an enzyme.
4. allosteric site on an enzyme.

79 An enzyme catalysed biochemical reaction in a living organism is being carried out at a certain rate at 20°C. If the temperature is raised to 30°C, it is generally expected that the rate:

1. will double
2. will decrease by half
3. will remain the same
4. will become zero and the reaction will stop

80 In general, with every 10°C rise in the temperature [in the range 0°C to 40°C], the rate of enzyme catalyzed reaction:

1. Becomes half
2. Gets doubled
3. Remains same
4. There is no such correlation in general

81 Rate of a physical or chemical process:

I: refers to the amount of product formed per unit time.
II: can also be called velocity if the direction is specified.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

82 Consider the given two statements

Assertion (A):	In the absence of carbonic anhydrase, carbon dioxide will not react with water to produce carbonic acid.
Reason (R):	Enzymes are the cause for the reactions to take place.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
3.	**(A)** is True, **(R)** is False.
4.	**(A)** is False, **(R)** is False.

83 Consider the given two statements:

I:	All enzymes are proteins.
II:	All proteins are enzymes.

1. Only **I** is true.
2. Only **II** is true.
3. Both **I** and **II** are true.
4. Neither **I** nor **II** are true.

84 In an enzyme catalysed biochemical reaction, the formation of enzyme-substrate complex is:

1. optional and transient
2. obligatory and transient
3. obligatory and permanent
4. needed only in anabolic reactions

85 Consider the two statements:

Statement I:	Whether it is an exothermic or spontaneous reaction or an endothermic or energy requiring reaction, the 'S' has to go through a much higher energy state or transition state.
Statement II:	Enzymes eventually bring down this energy barrier of activation energy making the transition of 'S' to 'P' more easy.

1.	**Statement I** is correct; **Statement II** is correct
2.	**Statement I** is correct; **Statement II** is incorrect
3.	**Statement I** is incorrect; **Statement II** is correct
4.	**Statement I** is incorrect; **Statement II** is incorrect

86 Consider the two statements:

Assertion (A):	Enzyme-catalyzed reactions proceed at rates vastly higher than that of uncatalyzed ones.
Reason:	Enzymes require an optimum temperature and an optimum pH to work efficiently.

1.	**(A)** is True but **(R)** is False.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is False but **(R)** is True.
4.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.

87 For an enzyme catalysed metabolic reaction:

I: the formation of an 'ES' complex is not obligatory.
II: 'ES' complex formation is a transient phenomenon.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

88 Which mechanism best describes the action of enzymes?

1.	Enzymes work by increasing the temperature of substrates.
2.	Enzymes reduce the activation energy needed for a reaction.
3.	Enzymes provide ATP to reactions.
4.	Enzymes permanently change shape after a reaction.

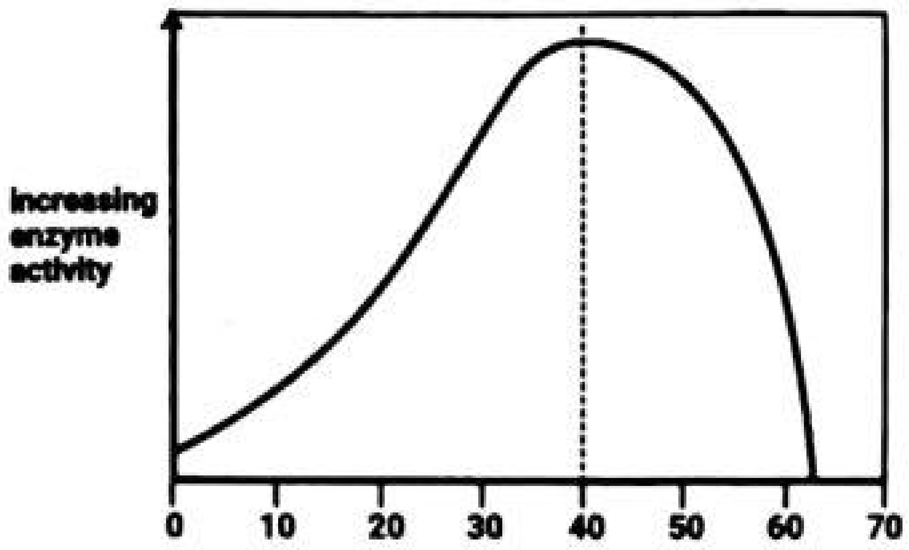
89 Which of the following will not be correct for the steps of the catalytic cycle of an enzyme action?

1.	First, the substrate binds to the active site of the enzyme, fitting into the active site.
2.	The binding of the substrate induces the enzyme to alter its shape, fitting more tightly around the substrate.
3.	The active site of the enzyme, now in close proximity of the substrate, breaks the chemical bonds of the substrate and the new enzyme- product complex is formed.
4.	The enzyme gets consumed in the reaction while releasing the product.

90 Identify the incorrect statement regarding enzyme action:

1.	Formation of [Enzyme Substrate] complex is obligatory
2.	Enzymes speed up a chemical reaction by lowering the requirement of activation energy
3.	Substrate need not go through a transition state if the enzyme catalyzed reaction is endothermic
4.	Enzymes are themselves not used up in the chemical reaction catalyzed by them

91 The graph shown below shows the effect of a certain factor on the rate of a reaction catalyzed by an enzyme. The X-axis would show the said factor and that will be:



1. substrate concentration	2. pH
3. enzyme concentration	4. temperature

92 Consider the given two statements:

Assertion (A):	High temperature destroys enzymatic activity.
Reason (R):	Enzymes generally function in a narrow range of temperatures.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	Both **(A)** and **(R)** are True but the **(R)** does not correctly explain **(A)**.
3.	**(A)** is True; **(R)** is False
4.	Both **(A)** and **(R)** are False

93 Identify the incorrect statement regarding enzymes:

1.	Enzymes generally function in a narrow range of temperature and pH.
2.	Each enzyme shows its highest activity at a particular temperature and a pH called the optimum temperature and the optimum pH.
3.	Activity declines both below and above the optimum value.
4.	Low temperatures denature the enzyme; high temperatures temporarily inactivate the enzyme.

94 Which statement correctly describes the impact of temperature on enzyme activity?

1.	Enzyme activity decreases indefinitely as temperature increases due to increased kinetic energy of the substrates.
2.	Enzyme activity increases until an optimum temperature is reached, beyond which activity declines rapidly due to denaturation.
3.	Enzyme activity is independent of temperature changes within the living organism's permissible range.
4.	High temperatures always increase enzyme stability and, therefore, enhance enzyme activity.

95 Consider the following two statements:

I:	Enzyme catalyzed reactions are affected by the change in the temperature and pH.
II:	Change in pH and temperature affects the tertiary structure of proteins.

1.	Both **I** and **II** are correct and **II** explains **I**
2.	Both **I** and **II** are correct but **II** does not explain **I**
3.	**I** is correct but **II** is incorrect
4.	**I** is incorrect but **II** is correct

96 Low temperature:

1. Preserves enzyme in a temporary inactive state
2. Denatures the enzyme
3. Makes enzyme more active
4. Does not have any affect on enzyme activity

97 Consider the given two statements:

Assertion (A):	With the increase in substrate concentration, the velocity of the enzymatic reaction rises at first and the reaction ultimately reaches a maximum velocity (Vmax) which is not exceeded by any further rise in concentration of the substrate.
Reason (R)	The enzyme molecules are fewer than the substrate molecules.

1. Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2. Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
3. **(A)** is True; **(R)** is False
4. Both **(A)** and **(R)** are False

98 Which of the following describes the substrate concentration at which an enzyme-catalyzed reaction achieves half Vmax?

1. K_m value
2. K_{cat} value
3. pK_a value
4. Q_{10}

99 The inhibition of succinic dehydrogenase by malonate is an example of:

1. Non-competitive reversible inhibition
2. Non-competitive irreversible inhibition
3. Competitive inhibition
4. Allosteric inhibition

100 The use of sulpha drugs used to slow down the growth of bacterial colonies is based on the principle of:

1. antigen-antibody interaction
2. competitive inhibition
3. allosteric feedback inhibition
4. mutagenesis

101 Consider the given statements regarding competi enzyme inhibition:

Statement I:	Competitive inhibitor closely resembles the substrate in its molecular structure
Statement II:	In spite of its close structural similarity with the substrate, the inhibitor does not compete with the substrate for the substrate-binding site of the enzyme.
Statement III:	Inhibition of succinic dehydrogenase by succinate which closely resembles the substrate malonate in structure is an example of competitive inhibition.

1. **Statement I** is correct; **Statement II** is correct; **Statement III** is correct
2. **Statement I** is incorrect; **Statement II** is correct; **Statement III** is incorrect
3. **Statement I** is correct; **Statement II** is incorrect; **Statement III** is incorrect
4. **Statement I** is correct; **Statement II** is correct; **Statement III** is incorrect

102 Consider the given two statements:

Assertion (A):	In competitive enzyme inhibition, the inhibitor binds to the active site of the enzyme, preventing the substrate from binding.
Reason (R):	Competitive inhibitors structurally resemble the substrate, allowing them to bind reversibly to the active site and reduce the enzyme's activity without affecting the maximal velocity (Vmax) of the reaction.

1. Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**
2. Both **(A)** and **(R)** are True and **(R)** does not correctly explain **(A)**
3. **(A)** is True, **(R)** is False
4. **(A)** is False, **(R)** is True

103 Consider the given two statements:

Assertion (A):	The effect of competitive inhibition can be overcome by increasing the substrate of the enzyme.
Reason (R):	The presence of a competitive inhibitor can decrease the rate of enzyme-catalyzed reaction by blocking the substrate from binding to the enzyme.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**
2.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**
3.	**(A)** is True but **(R)** is False
4.	**(A)** is False but **(R)** is True

104 Consider the given two statements:

I:	In competitive enzyme inhibition, the substrate and inhibitor cannot bind to the enzyme at the same time.
II:	The inhibitor always has a much higher affinity for the active site than the normal substrate.

1.	Both **I** and **II** are correct and **II** explains **I**
2.	Both **I** and **II** are correct but **II** does not explain **I**
3.	**I** is correct but **II** is incorrect
4.	**I** is incorrect but **II** is correct

105 Match each item in Column I with one in Column II and select the correct match from the codes given:

	Column I		**Column II**
A.	Lyases	P.	catalyse removal of groups from substrates by mechanisms other than hydrolysis, leaving double bonds
B.	Ligases	Q.	catalyse the linking together of 2 compounds
C.	Transferases	R.	catalyse the transfer of a group other than hydrogen between a pair of substrates
D.	Isomerases	S.	catalyse inter-conversion of optical, geometric or positional isomers

Codes:

	A	B	C	D
1.	P	Q	R	S
2.	Q	P	R	S
3.	P	Q	S	R
4.	R	R	Q	S

106 The enzymes that catalyse removal of groups from substrates by mechanisms other than hydrolysis leaving double bonds are called as:

1.	Oxidoreductases	2.	Hydrolases
3.	Ligases	4.	Lyases

107 The non protein constituent present in many enzymes is called:

1. Co-enzyme	2. Co-factor
3. Apoenzyme	4. Holoenzyme

108 Haem in hemoglobin:

1. is loosely bound
2. is the co-enzyme
3. is the prosthetic group
4. has no influence on activity of Hb

109 What is the co-factor for the proteolytic enzyme, carboxypeptidase?

1. Molybdenum	2. Manganese
3. Zinc	4. Copper

110 Most of the coenzymes contain:

1. Metal ions	2. FMN and FAD
3. Ribonucleoproteins	4. Vitamins

111 Consider the following two statements regarding enzyme action:

I:	Co-factors play a crucial role in the catalytic activity of the enzyme.
II:	Catalytic activity is reduced when the co-factor is removed from the enzyme.

Of the above statements:

1. Both **I** and **II** are correct and **II** explains **I**
2. Both **I** and **II** are correct but **II** does not explain **I**
3. **I** is correct but **II** is incorrect
4. **I** is incorrect but **II** is correct

112 Consider the following enzymes:

I. Catalase
II. Peroxidase
III. Carboxypeptidase

Which of these enzymes require haem as a co-factor for their activity?

1.	I only	2.	I and II only
3.	II and III only	4.	I, II and III

113 Co-enzymes:

I:	are organic compounds associated permanently with the apoenzyme.
II:	serve as co-factors in a number of different enzyme catalyzed reactions.
III:	have, many of them, vitamins as their essential chemical components.

1. Only **I** and **II** are correct
2. Only **I** and **III** are correct
3. Only **II** and **III** are correct
4. **I, II** and **III** are correct

114 Prosthetic groups are distinguished from other cofactors in that they:

I: are organic compounds.
II: are tightly bound to the apoenzyme.

1. Only **I** is true
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

115 Coenzymes nicotinamide adenine dinucleotide (NAD) and NADP contain the vitamin:

1.	Riboflavin	2.	Pantothenic acid
3.	Niacin	4.	Pteroylglutamic acid

116 Co-enzymes:

a. are inorganic compounds
b. are permanently associated with the apoenzyme
c. are organic compounds
d. are transiently associated with the apoenzyme.

1. a and b are correct
2. a and d are correct
3. b and c are correct
4. c and d are correct

117 Metal ions required by some enzymes as co-factors:

I:	form covalent bonds with side chains at the active site of the enzyme
II:	form one or more covalent bonds with the substrate.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

118 Identify the incorrect statement:

1.	Zinc is a cofactor for carboxypeptidase
2.	NADP contains the vitamin cyanocobalamin
3.	Malonate is a competitive inhibitor of Succinic dehydrogenase
4.	Haem is the prosthetic group in peroxidase

119 Which group of enzymes catalyze the chemical reaction where there is linking together of two compounds?

1. Lyases
2. Transferases
3. Isomerases
4. Ligases

120 Consider the given two statements:

Assertion (A):	Vitamins are essential components in metabolic processes.
Reason (R):	They act as coenzymes and help in the catalysis of biochemical reactions.

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**
3.	**(A)** is True but **(R)** is False
4.	**(A)** is False but **(R)** is True

BIOMOLECULES - ANSWER KEY

1.	**(1)**	2.	**(1)**	3.	**(1)**	4.	**(1)**	5.	**(1)**	6.	**(2)**	7.	**(4)**	8.	**(3)**	9.	**(2)**	10.	**(4)**
11.	**(1)**	12.	**(3)**	13.	**(3)**	14.	**(4)**	15.	**(2)**	16.	**(3)**	17.	**(3)**	18.	**(2)**	19.	**(1)**	20.	**(2)**
21.	**(1)**	22.	**(1)**	23.	**(3)**	24.	**(4)**	25.	**(3)**	26.	**(4)**	27.	**(1)**	28.	**(2)**	29.	**(4)**	30.	**(3)**
31.	**(2)**	32.	**(3)**	33.	**(4)**	34.	**(4)**	35.	**(3)**	36.	**(2)**	37.	**(2)**	38.	**(2)**	39.	**(2)**	40.	**(3)**
41.	**(1)**	42.	**(4)**	43.	**(3)**	44.	**(3)**	45.	**(3)**	46.	**(4)**	47.	**(3)**	48.	**(1)**	49.	**(1)**	50.	**(3)**
51.	**(2)**	52.	**(3)**	53.	**(4)**	54.	**(4)**	55.	**(4)**	56.	**(3)**	57.	**(3)**	58.	**(1)**	59.	**(2)**	60.	**(1)**
61.	**(3)**	62.	**(3)**	63.	**(3)**	64.	**(2)**	65.	**(4)**	66.	**(4)**	67.	**(1)**	68.	**(4)**	69.	**(2)**	70.	**(2)**
71.	**(1)**	72.	**(2)**	73.	**(1)**	74.	**(2)**	75.	**(2)**	76.	**(3)**	77.	**(1)**	78.	**(2)**	79.	**(1)**	80.	**(2)**
81.	**(3)**	82.	**(4)**	83.	**(4)**	84.	**(2)**	85.	**(1)**	86.	**(2)**	87.	**(2)**	88.	**(2)**	89.	**(4)**	90.	**(3)**
91.	**(4)**	92.	**(2)**	93.	**(4)**	94.	**(2)**	95.	**(1)**	96.	**(1)**	97.	**(1)**	98.	**(1)**	99.	**(3)**	100.	**(2)**
101.	**(3)**	102.	**(1)**	103.	**(2)**	104.	**(3)**	105.	**(1)**	106.	**(4)**	107.	**(2)**	108.	**(3)**	109.	**(3)**	110.	**(4)**
111.	**(3)**	112.	**(2)**	113.	**(3)**	114.	**(2)**	115.	**(3)**	116.	**(4)**	117.	**(4)**	118.	**(2)**	119.	**(4)**	120.	**(1)**

PHOTOSYNTHESIS IN HIGHER PLANTS

INTRODUCTION

1 Photosynthesis is important because:

I:	It is the primary source of all food on earth.
II:	It is responsible for the release of oxygen into the atmosphere by green plants.

1.	Only **I** is correct
2.	Only **II** is correct
3.	Both **I** and **II** are correct
4.	Both **I** and **II** are incorrect

2 Identify the correct statements:

I:	Only green plants can prepare their own food.
II:	In green plants, all cells, tissues and organs photosynthesise.

1.	Only **I**
2.	Only **II**
3.	Both **I** and **II**
4.	Neither **I** nor **II**

3 A part of a leaf is enclosed in a test tube containing some KOH soaked cotton, while the other half is exposed to air. The setup is then placed in light for some time. Later, the exposed part of the leaf tested positive for starch, while the portion that was in the tube, tested negative. This showed that:

I:	CO_2 was required for photosynthesis
II:	Light is not essential for carbon fixation in photosynthesis.

1.	Only **I** is correct
2.	Only **II** is correct
3.	Both **I** and **II** are correct
4.	Both **I** and **II** are incorrect

EARLY EXPERIMENTS

4 The hypothesis "Plants restore to the air whatever breathing animals and burning candles remove" was given, after his experiments, by:

1.	Joseph Priestley	2.	Jan Ingenhousz
3.	Julius von Sachs	4.	C. B. Van Neil

5 Who first showed that it is only the green parts of the plants that could release oxygen during photosynthesis?

1.	Joseph Priestley	2.	Jan Ingenhousz
3.	Julius von Sachs	4.	C. B. Van Neil

6 Julius von Sachs provided evidence for:

I:	production of glucose when plants grow
II:	location of green substance in plants in special bodies

Which of the following will be true in light of the information given above?

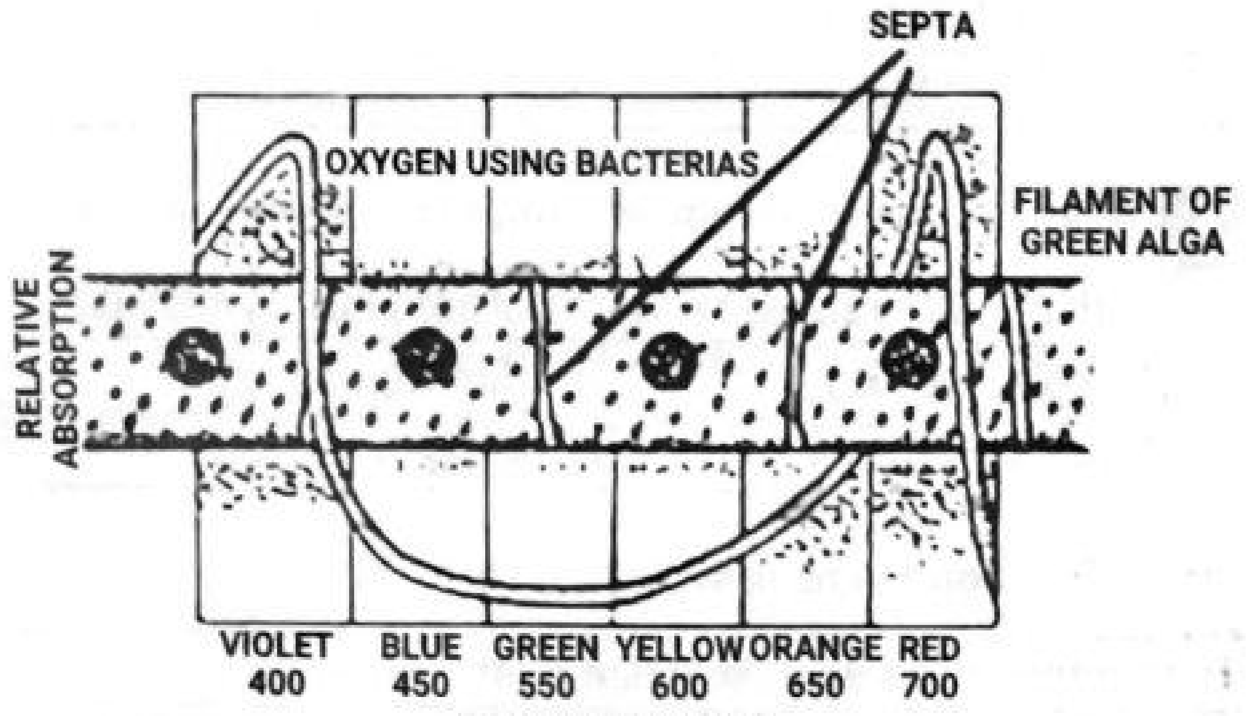
A:	Glucose produced during photosynthesis is usually stored as cellulose in plants.
B:	The 'green substance' refers to chlorophyll.
C:	'Special bodies' refer to chloroplasts in the plant cells.

1.	Only **A** and **B**	2.	Only **B** and **C**
3.	Only **A**	4.	**A**, **B** and **C**

7 C. B. van Niel proved that:

1.	Plants produce glucose when they grow.
2.	Blue and red light are effective for photosynthesis.
3.	It is only the green parts of the plants that could release oxygen.
4.	Hydrogen from a suitable oxidizable compound reduces carbon dioxide to carbohydrates.

8 The diagram shows the famous Engelmann experiment that helped us understand important aspects of the process of photosynthesis. What conclusion can be drawn by the pattern of accumulation of aerobic bacteria shown in the diagram?



1.	Excess carbon dioxide is released by the alga in the area of accumulation.
2.	Only red and violet lights are effective for photosynthesis.
3.	In the areas of accumulation, most oxygen was liberated by the alga.
4.	Bacteria are attracted to red and blue light.

9 The correct and complete equation for the process of photosynthesis in higher plants will be:

1.	$6CO_2 + 12H_2O + \text{light energy} \rightarrow C_6H_{12}O_6 + 6O_2 + 6H_2O$
2.	$6CO_2 + 6H_2O + \text{light energy} \rightarrow C_6H_{12}O_6 + 6O_2$
3.	$CO_2 + H_2O + \text{light energy} \rightarrow [CH_2O] + O2$
4.	$C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$

10 Who predicted that plants give off oxygen as a result of splitting of water molecules during photosynthesis, not of carbon dioxide molecules as thought before?

1.	Preistley	2.	C. B. van Neil
3.	T. W. Engelmann	4.	Arnon and his co-workers

11 T.W Engelmann:

I:	described first absorption spectrum of photosynthesis.
ii:	first showed that it is only the green part of the plants that could release oxygen.

1.	Only **I** is correct
2.	Only **II** is correct
3.	Both **I** and **II** are correct
4.	Both **I** and **II** are incorrect

12 Organisms can be classified by how they obtain carbon and energy where:

I:	Heterotrophs are organisms that obtain nutrients by consuming the carbon of other organisms
II:	Autotrophs are organisms that produce their own nutrients from the carbon of inorganic substances like carbon dioxide.

1.	Only **I** is correct
2.	Only **II** is correct
3.	Both **I** and **II** are correct
4.	Both **I** and **II** are incorrect

13 The first action spectrum of photosynthesis was described by:

1. T. W. Engelman
2. Julius Sachs
3. Joseph Priestley
4. Jan Ingenhousz

14 Identify the option where the name of the scientist is not correctly matched with discovery related to understanding of the process of photosynthesis:

1.	Cornelius van Neil	Oxygen evolved comes from water
2.	T W Engelmann	First absorption spectrum of chlorophyll a
3.	Joseph Priestley	Plants restore to the air whatever breathing animals remove
4.	Jan Ingenhousz	Sunlight is essential for photosynthesis

WHERE DOES PHOTOSYNTHESIS TAKE PLACE?

15 There is a clear division of labour within the chloroplast where:

I:	the membrane system is responsible for trapping the light energy and for the synthesis of ATP and NADPH.
II:	in stroma, enzymatic reactions synthesise sugar, which in turn forms starch and synthesis of ATP but not NADPH takes place.

1.	Only **I** is correct
2.	Only **II** is correct
3.	Both **I** and **II** are correct
4.	Both **I** and **II** are incorrect

16 Consider the given two statements:

I:	Carbon reactions during photosynthesis in higher plants are called as dark reactions.
II:	They occur in darkness and they are not light-dependent.

1.	Both **I** and **II** are correct and **II** explains **I**
2.	Both **I** and **II** are correct but **II** does not explain **I**
3.	**I** is correct but **II** is incorrect
4.	**I** is incorrect but **II** is correct

17 The site of production of NADPH and ATP in a plant cell is:

1. matrix of the mitochondria
2. cristae of the mitochondria
3. stroma of the chloroplast
4. thylakoid membranes of the chloroplast

18 Light dependent reactions are so called because they require light:

1.	to provide electrons for the process
2.	to split the water molecule
3.	to impart energy to the electrons in the reaction center
4.	to hydrolyse ATP molecules

HOW MANY TYPES OF PIGMENTS ARE INVOLVED IN PHOTOSYNTHESIS

19 A chromatographic separation of the leaf pigments shows that the colour that we see in leaves is not due to a single pigment but due to four pigments. The colours, bright or blue green, in the chromatogram are associated with:

1.	Chlorophyll a	2.	Chlorophyll b
3.	Xanthophylls	4.	Carotenoids

20 Match each item in Column I with one in Column II and select the correct match from the codes given:

	Column I		**Column II**
A.	Chlorophyll a	P.	Bright or blue-green
B.	Chlorophyll b	Q.	Yellow-green
C.	Xanthophylls	R.	Yellow
D.	Carotenoids	S.	Yellow to yellow-orange

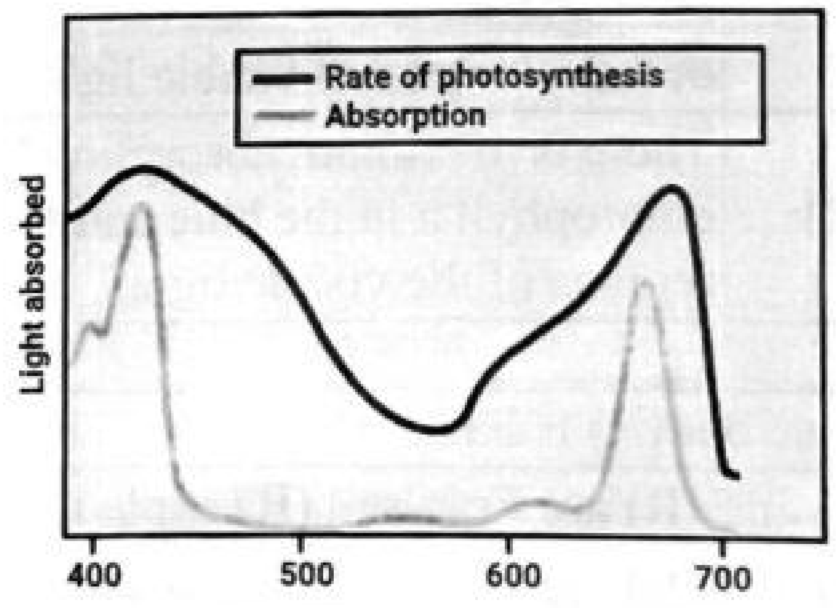
Codes

	A	B	C	D
1.	P	Q	R	S
2.	Q	R	S	P
3.	R	S	P	Q
4.	S	P	Q	R

21 The wavelengths of light most useful in photosynthesis are:

1.	green and orange	2.	red and blue
3.	infrared and yellow	4.	red and green

22 The absorption spectrum in the given diagram will be of:



1.	Chlorophyll a	2.	Chlorophyll b
3.	Carotenoids	4.	Retinol

23 The accessory pigments of photosynthesis:

I:	include Carotenoids and Xanthophylls but not Chlorophyll b.
II:	enable a wider range of wavelength of incoming light to be utilised for photosynthesis.
III:	protect Chlorophyll a from photo-oxidation.

1. Only **I** and **II** are correct
2. Only **I** and **III** are correct
3. **I, II** and **III** are correct
4. Only **II** and **III** are correct

24 It can be correctly said about the relation between the absorption spectra of various pigments and the action spectrum of photosynthesis that:

1.	There is a complete one to one overlap between the absorption spectrum of chlorophyll a and the action spectrum of photosynthesis.
2.	There is a complete one to one overlap between the absorption spectrum of chlorophyll b and the action spectrum of photosynthesis.
3.	The absorption spectrum of chlorophyll a is wider than the action spectrum of photosynthesis.
4.	The absorption spectrum of chlorophyll a is narrower than the action spectrum of photosynthesis.

25 Which wavelength of the visible spectrum of sunlight carries maximum energy?

1.	Violet/Blue	2.	Green
3.	Yellow	4.	Red

26 Consider the two statements:

Assertion (A):	Higher rate of photosynthesis is seen when plants are provided with blue and red regions of wavelengths of visible light.
Reason (R):	There is maximum absorption by chlorophyll a in the blue and the red regions of the visible light.

1.	**(A)** is True but **(R)** is False
2.	Both **(A)** and **(R)** are True and **(R)** explains **(A)**
3.	Both **(A)** and **(R)** are True but **(R)** does not explain **(A)**
4.	Both **(A)** and **(R)** are False

27 The colour/s of visible light that work/s least well for photosynthesis is/are:
1. Red and Blue
2. Violet and Yellow
3. Green
4. Yellow

28 What role does chlorophyll b play in photosynthesis?

1.	It acts as the primary pigment absorbing light for photosynthesis.
2.	It assists chlorophyll a by expanding the range of light wavelengths that can be absorbed.
3.	It is directly involved in the conversion of light energy to chemical energy.
4.	It protects chlorophyll a from photodamage by dissipating excessive light.

29 What is the most important role that accessory pigments play in photosynthesis?

1.	They protect chlorophyll b from photodamage.
2.	They absorb light and transfer energy to chlorophyll.
3.	They catalyze the splitting of water.
4.	They fix carbon dioxide into sugars.

WHAT IS LIGHT REACTION?

30 Photochemical phase of oxygenic photosynthesis does not include:
1. Light absorption
2. Water splitting
3. Formation of ATP and NADPH
4. Synthesis of sugar

31 Light Harvesting Complex (LHC) or antenna of a photosystem includes all the following except:
1. Chlorophyll a
2. Chlorophyll b
3. Xanthophylls
4. Carotenoids

32 What is the key difference between the reaction center chlorophyll molecule and other pigment molecules in a photosystem?

1.	Reaction center chlorophyll molecules are less abundant than other pigments.
2.	Only reaction center chlorophyll molecules can transfer the excited electron to an electron acceptor.
3.	Other pigment molecules do not participate in the light reactions of photosynthesis.
4.	Reaction center chlorophyll molecules are located in the stroma, while other pigments are in the thylakoid membrane.

33 In a photosystem:

1.	The reaction centre is where light is captured, while the antenna complex is where this light energy is transformed into chemical energy.
2.	The antenna complex is where light is captured, while the reaction centre is where this light energy is transformed into chemical energy.
3.	The antenna complex is where light energy is captured and transformed into chemical energy.
4.	The reaction centre is where light energy is captured and transformed into chemical energy.

34 In PS I, the reaction centre chlorophyll a has an absorption peak at:

1.	660 nm	2.	680 nm
3.	700 nm	4.	730 nm

35 What is the site of the light-dependent reactions in photosynthesis in higher plants?

1. Stroma of chloroplasts
2. Thylakoid membrane
3. Lumen of thylakoid
4. Intermembrane space

36 Identify the correct statements:

I:	Photosystem I (PS I) functions before Photosystem II (PS II) during the light reaction.
II:	In PS I, the reaction centre chlorophyll a has an absorption peak at 680 nm, hence is called P680.
III:	In PS II, the reaction centre chlorophyll a has absorption maxima at 700 nm, and is called P700.

1. Only **I**
2. Only **II** and **III**
3. **I, II** and **III**
4. All are incorrect

37 Given below are two statements:

Assertion (A):	The reaction centres in both photosystems in plants is the same.
Reason (R):	The reaction centres of both photosystems are formed by chlorophyll b molecules.

1.	Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are true but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is true but **(R)** is false.
4.	Both **(A)** and **(R)** are false.

THE ELECTRON TRANSPORT

38 What happens to the electrons of PS II in the electron transport chain during the light reaction of photosynthesis?

1.	They are stored in pigments of photosystem II.
2.	They are used up during the process.
3.	They pass through the electron transport chain and are transferred to pigments of photosystem I.
4.	They combine directly with $NADP^+$ to form NADPH.

39 What is the final electron acceptor in the electron transport chain during the light reaction?

1. $NADP^+$
2. ATP
3. Oxygen
4. Water

40 What is the Z scheme in the context of photosynthesis?

1.	The process of ATP formation.
2.	The movement of electrons downhill in redox potential scale from PS II to PS I and then to $NADP^+$.
3.	The shape of chlorophyll molecule.
4.	The pathway of carbon fixation.

41 Why is the shape of the electron transport process termed the Z scheme?

1.	Because of the zig-zag shape of the pathway.
2.	Due to the characteristic shape of the energy levels when all carriers are placed in sequence on a redox potential scale.
3.	Because it represents the structure of chlorophyll.
4.	Due to the shape of the ATP synthase enzyme.

42 Identify the correct statement regarding the functioning of photosystem II?

1.	The reaction center is P700.
2.	It works after PS I in non cyclic photophosphorylation.
3.	Water splits and carbon dioxide is released.
4.	The electron vacancies in P680 are filled by electrons derived from water.

43 The products of non-cyclic photophosphorylation include:

1.	ATP and P700	2.	ATP and NADPH
3.	ADP and NADP	4.	P700 and P680

44 Consider the given two statements:

I:	Water splitting complex is associated with PSII in photosynthetic plants.
II:	Chlorophyll a reaction center in PSII is called as P680

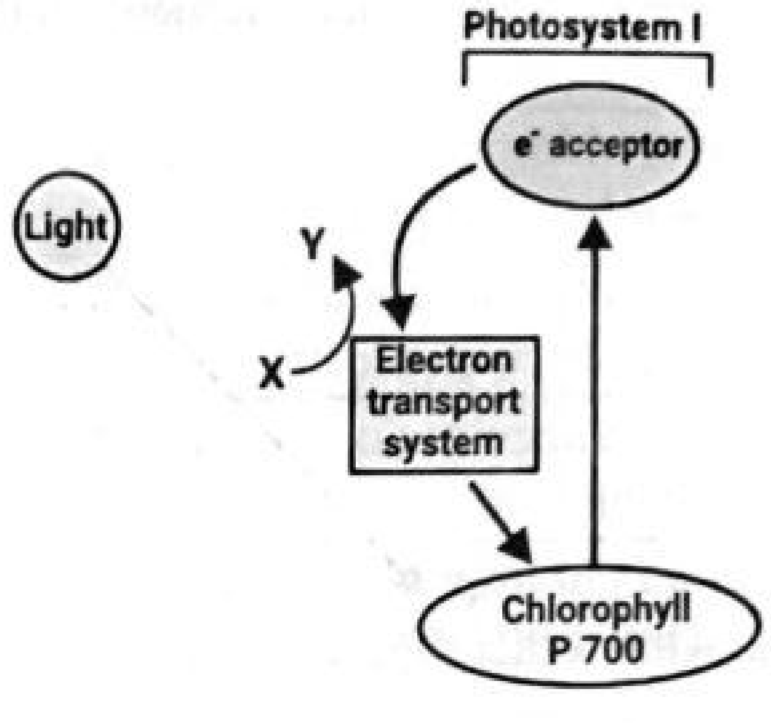
1. Only **I**
2. Only **II**
3. Both **I** and **II** are correct
4. Neither **I** nor **II**

45 Consider the two statements:

I:	The water-splitting complex is located on the inner side of the thylakoid membrane
II:	The NADP reductase enzyme is located on the stromal side of the thylakoid membrane

1.	Only **I** is correct
2.	Only **II** is correct
3.	Both **I** and **II** are correct
4.	Both **I** and **II** are incorrect

46 The given diagram shows the scheme of:



1.	Cyclic photophosphorylation and Y is NADPH
2.	Cyclic photophosphorylation and Y is ATP
3.	Non-Cyclic photophosphorylation and Y is NADPH
4.	Non-Cyclic photophosphorylation and Y is ATP

47 Production of ATP through phosphorylation in a eukaryotic cell can take place in:
I: Cytosol
II: Mitochondria
III: Chloroplasts
1. Only I
2. Only II and III
3. Only I and II
4. I, II and III

48 The reduction of NADP $^{+}$ to NADPH + H^{+} during non-cyclic photophosphorylation directly requires:

I:	electrons that come from water.
II:	protons that are removed from the stroma.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

49 Which of the following replaces the electrons removed from the reaction center chlorophyll-A molecule of the photosystem I in non-cyclic photophosphorylation?
1. The light harvesting complex of PS-I
2. Water
3. PS-II
4. NADPH

50 What is a critical difference between cyclic and non-cyclic photophosphorylation?

1.	Cyclic photophosphorylation produces ATP and NADPH, while non-cyclic produces only ATP.
2.	Non-cyclic photophosphorylation involves both photosystems, while cyclic involves only one.
3.	Cyclic photophosphorylation produces oxygen, whereas non-cyclic does not.
4.	Non-cyclic photophosphorylation requires light, cyclic does not.

51 Consider the two statements:

Assertion (A):	Cyclic photophosphorylation results only in the synthesis of ATP, but not of NADPH + H^+.
Reason (R):	Cyclic photophosphorylation occurs only when light of wavelengths beyond 680 nm are available for excitation.

1.	**(A)** is True but **(R)** is False
2.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**
3.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**
4.	Both **(A)** and **(R)** are False

52 Consider the given two statements:

Statement I:	When only PS I is functional, the electron is circulated within the photosystem and the phosphorylation occurs due to cyclic flow of electrons.
Statement II:	Cyclic photophosphorylation also occurs when only light of wavelengths beyond 680 nm are available for excitation.

1.	Both **Statement I** and **Statement II** are correct
2.	Both **Statement I** and **Statement II** are incorrect
3.	**Statement I** is correct but **Statement II** is incorrect
4.	**Statement I** is incorrect but **Statement II** is correct

53 Consider the two statements:

Assertion(A):	The protons or hydrogen ions that are produced by the splitting of water accumulate within the lumen of the thylakoids.
Reason(R):	The primary accepter of electrons, which is located towards the outer side of the membrane, transfers its electron not to an electron carrier but to an H carrier.

1.	**(A)** is True but **(R)** is False
2.	Both **(A)** and **(R)** are True and **(R)** explains **(A)**
3.	Both **(A)** and **(R)** are True but **(R)** does not explain **(A)**
4.	Both **(A)** and **(R)** are False

54 Consider the following two statements:

The stromal lamellae membranes in the chloroplast lack

A: Photosystem II

B: NADP reductase enzyme

1. Only **A** is correct
2. Only **B** is correct
3. Both **A** and **B** are correct.
4. Both **A** and **B** are incorrect.

55 The NADP reductase enzyme is located:

1.	within the thylakoid membrane
2.	on the stroma side of the thylakoid membrane
3.	on the lumen side of the thylakoid membrane
4.	in the thylakoid lumen

56 Regarding the thylakoid membrane:

I:	Plastoquinone is located within the membrane
II:	Plastocyanin is located on the inner lumen side of the membrane
III:	NADP reductase is located on the stroma side of the membrane

1.	Only **I** and **II** are correct
2.	Only **I** and **III** are correct
3.	Only **II** and **III** are correct
4.	**I, II** and **III** are correct

57 Chemiosmosis in chloroplasts is possible because of:

1.	establishment of a proton gradient across the thylakoid membrane.
2.	diffusion of electrons through the ATP synthase.
3.	osmosis of water from thylakoid to stroma.
4.	presence of large amount of oxygen in the stroma.

58 Consider the two statements:

Assertion(A):	Breakdown of proton gradient across the thylakoid membrane leads to the synthesis of ATP.
Reason(R):	The gradient is broken down due to the movement of protons across the membrane to the stroma through the transmembrane channel of the CF_0 of the ATP synthase.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	Both **(A)** and **(R)** are False.

59 In photosynthesis, ATP synthesis is linked to the development of a proton gradient across a membrane. The protons are accumulated in:

1. the inter-membrane space
2. thylakoid space
3. stroma
4. cytosol

60 Chemiosmosis does not require:

1. a membrane leaky to protons
2. a proton pump
3. a proton gradient
4. ATP synthase

61 To establish a proton gradient across the thylakoid membrane, the protons are provided by:

1.	Glucose	2.	Chlorophyll
3.	Membrane proteins	4.	Water

62 Regarding chemiosmotic ATP synthesis in the chloroplast:

I:	There is a large number of hydrogen ions in the thylakoid space compared to the number in the stroma.
II:	Hydrogen ions diffuse through special channels called ATP synthase complex.
III:	ATP synthase complex splits ATP into ADP plus phosphate.
IV:	Hydrogen ions flow down their electrochemical gradient through the ATP synthase complex.

1. Only **I**, **II** and **III** are correct
2. Only **I**, **II** and **IV** are correct
3. Only **II**, **III** and **IV** are correct
4. Only **II** and **III** are correct

63 The correct chronological sequence of protein complexes in the thylakoid membrane involved in light reactions is:

1.	Photosystem II (PS II), Cytochrome b6f complex, Photosystem I (PS I), and ATP synthase.
2.	Photosystem I (PS I), Cytochrome b6f complex, Photosystem II (PS II), and ATP synthase.
3.	Photosystem II (PS II), Photosystem I (PS I), Cytochrome b6f complex, and ATP synthase.
4.	Photosystem I (PS I), Photosystem II (PS II), Cytochrome b6f complex, and ATP synthase.

64 The ATP synthase consists of two parts where:

1.	F_0 is a transmembrane channel and F_1 protrudes out towards stroma
2.	F_1 is a transmembrane channel and F_0 protrudes out towards stroma
3.	F_0 is a transmembrane channel and F_1 protrudes out towards lumen of thylakoid
4.	F_1 is a transmembrane channel and F_0 protrudes out towards lumen of thylakoid

65 Consider the given two statements:

Statement I:	CF_1 particle of ATP synthase makes ATP molecules.
Statement **II:**	CF_1 particle of ATP synthase is embedded in the thylakoid membrane and forms a transmembrane channel that carries out facilitated diffusion of protons across the membrane.

1.	Both **Statement I** and **Statement II** are correct
2.	Both **Statement I** and **Statement II** are incorrect
3.	**Statement I** is correct but **Statement II** is incorrect
4.	**Statement I** is incorrect but **Statement II** is correct

WHERE ARE THE ATP & NADPH USED?

66 Immediately after light becomes unavailable, the biosynthetic phase of photosynthesis continues for some time and then stops. If then, light is made available, the synthesis starts again. A logical conclusion of these observations will include:

I:	Biosynthetic phase does not directly depend on the presence of light.
II:	Biosynthetic phase depends on the products of light reactions.
III:	Biosynthesis phase occurs only in the dark or in the absence of light.

1.	Only **I** and **II**	2.	Only **III**
3.	Only **II**	4.	**I, II** and **III**

67 In photosynthesis, energy from light reaction to dark reaction is transferred in the form of

1.	ADP	2.	ATP
3.	RUDP	4.	Chlorophyll

68 Identify the correct statement:

1.	The light reactions provide ATP and NADPH to the Calvin cycle.
2.	The light reactions provide CO_2 to the Calvin cycle.
3.	The light reactions supply oxygen to the Calvin cycle.
4.	Calvin cycle is in no way dependent on the light reactions.

69 Consider the given two statements:

Assertion (A):	The term "dark reaction" is considered a misnomer for the Calvin cycle.
Reason (R):	These reactions do not require darkness to occur, but rather they do not directly require light.

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	**(A)** is False but **(R)** is True.

70 The radioactive isotope of carbon used by Melvin Calvin to work out the complete biosynthetic pathway in C_3 plants was:

1. ^{11}C
2. ^{12}C
3. ^{13}C
4. ^{14}C

71 The C_3 pathway:

1. is common to all plants
2. takes place in mesophyll cells in C_4 plants
3. takes place in bundle sheath cells in C_3 plants
4. does not take place in CAM plants

72 The reactions of the Calvin cycle can take place as long as which of the following products of the light dependent reactions are available?

1.	Water and Glucose	2.	Water and ATP
3.	Oxygen and Carbon dioxide	4.	ATP and NADPH

73 A C_3 plant was provided carbon dioxide labelled with a radioactive isotope. The amount of radioactivity was measured in chloroplasts. In which of the following molecules do you expect the radioactivity to appear first as the process of photosynthesis proceeds in this plant?

1.	OAA	2.	PEP
3.	PGA	4.	RuBP

74 The C_3 and C_4 photosynthesis pathways are so called because the initial carbon fixation product in them are respectively:

1.	pyruvate; malate
2.	malate; pyruvate
3.	3-phosphoglycerate; oxaloacetic acid
4.	glyceraldehyde 3-phosphate; phospho-enol-pyruvate (PEP)

75 RuBP is:

1.	2 carbon ketose sugar	2.	2 carbon aldose sugar
3.	5 carbon ketose sugar	4.	5 carbon aldose sugar

76 NADPH and ATP:

I:	are the products of the light dependent reactions of photosynthesis.
II:	are used in the light independent reactions of photosynthesis.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

77 Which of the following must occur in the biochemical pathway of Calvin cycle?

1. addition of a pair of electrons from NADPH
2. inactivation of RuBP carboxylase enzyme
3. regeneration of ATP from ADP
4. regeneration of RuBP

78 The primary function of the Calvin cycle is to:

1. use ATP to release carbon dioxide
2. use NADPH to release carbon dioxide
3. split water and release oxygen
4. fix inorganic carbon to simple sugars

79 Consider the given two statements:

Assertion(A):	The enzyme that catalyses carboxylation of RuBP in Calvin cycle would be more correctly called RuBisCO rather than RuBP carboxylase.
Reason(R):	This enzyme also has an oxygenation activity apart from a carboxylase activity.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	Both**(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	Both **(A)** and **(R)** are False

80 Rubisco enzyme is involved in two activities, which are:

1.	Photolysis of water and carbon fixation
2.	Carbon fixation and oxygenation of RuBP
3.	ATP synthesis and NADPH formation
4.	Oxygen evolution and reduction of carbon dioxide

81 Both ATP and NADPH are required in the Calvin cycle during:

1. carbon dioxide fixation
2. carbon dioxide reduction
3. regeneration of RuBP
4. cyclic electron pathway

82 For every CO_2 molecule entering the Calvin cycle:

1.	3 molecules of ATP and 3 of NADPH are required.
2.	3 molecules of ATP and 2 of NADPH are required.
3.	3 molecules of ATP and 3 of NADPH are required.
4.	2 molecules of ATP and 2 of NADPH are required

83 In order to assimilate one CO_2 molecule via photosynthesis, the green plants require:

1. 9 ATP and 6 NADPH molecules
2. 5 ATP and 3 NADPH molecules
3. 3 ATP and 2 NADPH molecules
4. 18 ATP and 12 NADPH molecules

84 The number of turns of Calvin cycle required to produce one molecule of Glyceraldehyde 3 Phosphate is:

1.	1	2.	2
3.	3	4.	6

85 In the 'Regeneration' stage of the Calvin cycle:

1.	Five G3P molecules produce three RuBP molecules, using up three molecules of ATP.
2.	Three G3P molecules produce five RuBP molecules, using up three molecules of ATP.
3.	Three G3P molecules produce five RuBP molecules, using up five molecules of ATP.
4.	Five G3P molecules produce three RuBP molecules, using up five molecules of ATP.

86 The primary products of the Calvin cycle include:

1.	Oxygen and glucose
2.	ATP and NADPH
3.	Glucose, ADP, and $NADP^+$
4.	G3P (Glyceraldehyde-3-Phosphate), ADP, and $NADP^+$

THE C4 PATHWAY

87 The number of atoms of carbon in a molecule of oxaloacetic acid is/are:

1.	1	2.	3
3.	4	4.	5

88 The first stable product of CO_2 fixation in sorghum is:

1.	Succinic acid	2.	Phosphoglyceric acid
3.	Pyruvic acid	4.	Oxaloacetic acid

89 Select the statements that will be true for C_4 plants:

I:	Calvin cycle takes place in Bundle sheath cells
II:	Number of carbon atoms in the primary carbon dioxide acceptor is 5
III:	Initial carboxylation reaction occurs in mesophyll cells
IV:	Primary carbon dioxide fixation product is oxaloacetic acid

1.	Only **I, II** and **III**	2.	Only **I, III** and **IV**
3.	Only **II, III** and **IV**	4.	**I, II, III** and **IV**

90 Regarding Kranz anatomy, the bundle sheath cells:

1.	are rich in an enzyme Ribulose bisphosphate carboxylase-oxygenase (RuBisCO) but lack PEPcase.
2.	are rich in enzymes Ribulose bisphosphate carboxylase-oxygenase (RuBisCO) and PEPcase.
3.	lack enzymes Ribulose bisphosphate carboxylase-oxygenase (RuBisCO) and PEPcase.
4.	lack enzyme Ribulose bisphosphate carboxylase-oxygenase (RuBisCO) but are rich in PEPcase.

91 The bundle sheath cells in Kranz anatomy arrangement:

1.	may form several layers around the vascular bundles
2.	are characterised by having only a few number of chloroplasts
3.	have thin walls freely permeable to gaseous exchange
4.	have large intercellular spaces.

92 Consider the given two statements:

Assertion (A):	Kranz anatomy is crucial for the efficiency of C_4 plants.
Reason (R):	Kranz anatomy allows for a higher concentration of carbon dioxide at the site of the Calvin cycle.

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	**(A)** is False but **(R)** is True.

93 The bundle sheath cells are characterized by:

I:	a large number of chloroplasts present in them
II:	thick cell walls impervious to gas exchange
III:	large intercellular spaces

1. Only **I** and **II**	2. Only **I** and **III**
3. Only **II** and **III**	4. **I, II** and **III**

94 In Hatch and Slack pathway:

I:	The C_4 acid OAA is formed in the mesophyll cells.
II:	Malic acid or aspartic acid are transported to the bundle sheath cells.
III:	C_4 acids are broken down to release carbon dioxide and a 3 carbon molecule in mesophyll cells.
IV:	The 3 carbon molecule is transported back to the bundle sheath cell where it is converted to PEP again.

1. Only **I** and **II** are correct
2. **II**, **III** and **IV** are incorrect
3. Only **I**, **II** and **III** are correct
4. **I**, **II**, **III** and **IV** are correct

95 C_4 carbon fixation, one of three known photosynthetic processes of carbon fixation in plants, is also called as:

1. Calvin Benson cycle
2. Tricarboxylic acid cycle
3. Hatch–Slack pathway
4. Embden-Meyerhof-Parnas pathway

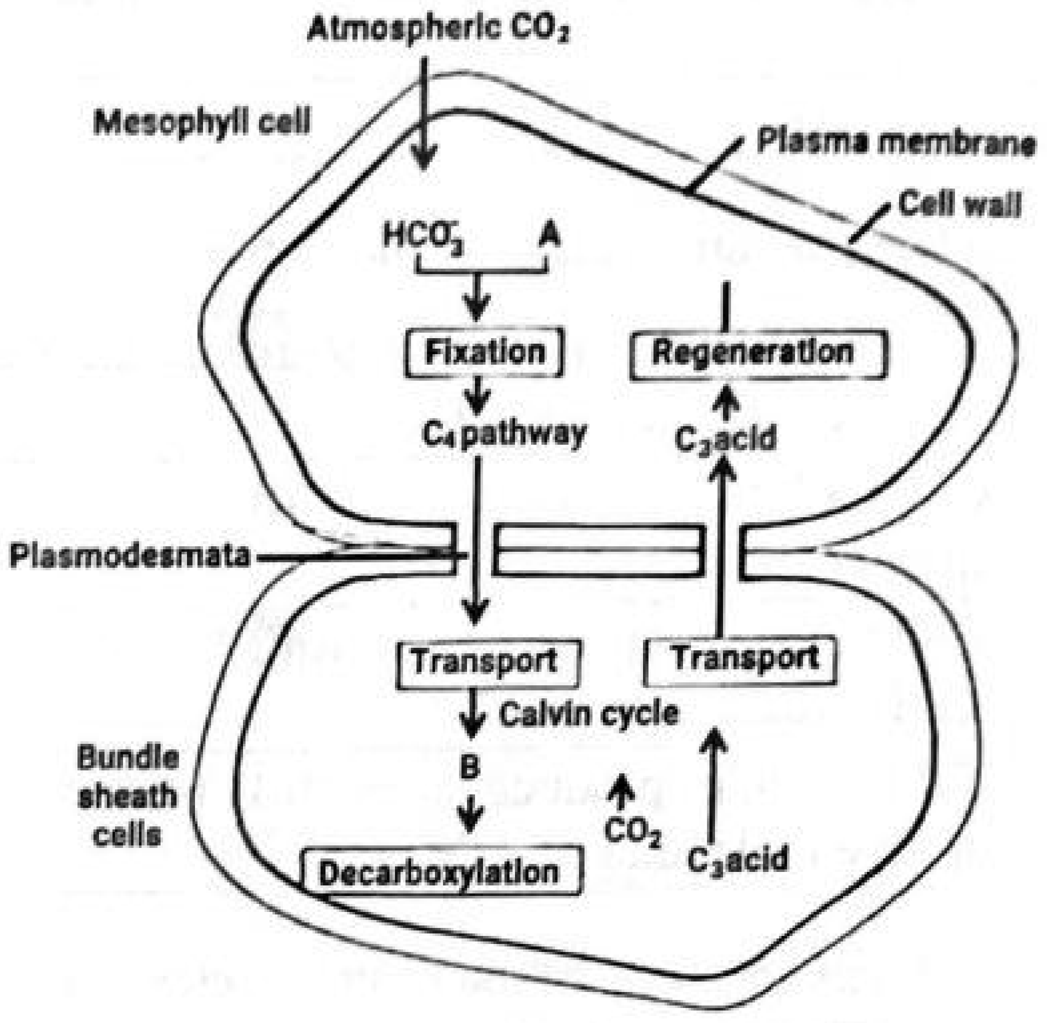
96 The primary CO_2 acceptor in C_4 plants is:

1. RuBP in mesophyll cells
2. RuBP in bundle sheath cells
3. PEP in mesophyll cells
4. PEP in bundle sheath cells

97 In C_4 pathway, the 4-carbon compound transported to bundle sheath cells most commonly is:

1.	Glutamic acid	2.	Malic acid
3.	Oxaloacetic acid	4.	Fumaric acid

98 The following diagram shows the C_4 photosynthetic carbon cycle. A and B can respectively be:



1. Pyruvate; malate or aspartate
2. Phoshoglycerate; fumarate or aspartate
3. Phosphoenol pyruvate; malate or aspartate
4. Phosphoenol pyruvate; fumarate or aspartate

99 In C_4 plants, the four carbon compounds like oxalic acid and malic acid:

1.	are formed in mesophyll cells and transported to bundle sheath cells
2.	are formed in bundle sheath cells and transported to mesophyll cells
3.	are formed in mesophyll cells, get decarboxylated in mesophyll cells and the resultant three carbon molecule is transported to bundle sheath cells.
4.	are formed in bundle sheath cells and get decarboxylated in mesophyll cells

100 In the leaves of C_4 plants, malic acid formation during CO_2 fixation occurs in the cells of :

1.	mesophyll	2.	bundle sheath
3.	phloem	4.	epidermis

101 What are correct differences between C_3 plants and C_4 plants?

I:	Primary CO_2 acceptor in C_3 plants is RuBP and PEP in C_4 plants
II:	Calvin cycle takes place in mesophyll cells in C_3 plants and in bundle sheath cells in C_4 plants.

1. Only **I**
2. Only **II**
3. Both **I** and **II**
4. Neither **I** nor **II**

102 Which of the following is a key difference between C_3 and C_4 plants?

1.	C_4 plants perform photosynthesis only at night.
2.	C_3 plants have a higher water-use efficiency than C_4 plants.
3.	C_4 plants utilize PEP carboxylase to capture CO_2, resulting in lack of photorespiration.
4.	C_3 plants have a mechanism to concentrate CO_2 in bundle sheath cells, unlike C_4 plants.

PHOTORESPIRATION

103 When the ratio, $CO_2 : O_2$ is nearly equal, RuBisCO:

1. has no affinity for oxygen
2. has a much greater affinity for carbon dioxide
3. has a much greater affinity for oxygen
4. has equal affinity for both carbon dioxide and oxygen

104 In photorespiration, RuBisCO:

1. adds carbon dioxide to RuBP
2. gets denatured
3. adds oxygen to RuBP
4. acquires a very high affinity for carbon dioxide

105 RuBisCO:

I:	is the most abundant enzyme in the world
II:	is characterised by the fact that its active site can bind to both CO_2 and O_2
III:	has a much greater affinity for CO_2 when the CO_2: O_2 is nearly equal

1. Only **I** and **II** are correct
2. Only **I** and **III** are correct
3. Only **II** and **III** are correct
4. **I**, **II** and **III** are correct

106 The 2-carbon compound formed in photorespiration is:

1.	Acetyl CoA	2.	Phosphoglycolate
3.	Acetic acid	4.	Ethanol

107 In the photorespiratory pathway:

I:	there is no synthesis of sugars
II:	there is release of carbon dioxide with the utilization of ATP
III:	ATP is synthesized but NADPH is not synthesized

1. Only **I** and **II** are correct
2. Only **I** and **III** are correct
3. Only **II** and **III** are correct
4. **I**, **II** and **III** are correct

108 Photorespiration is a wasteful process. Why is it so?

1.	The number of ATP molecules produced in the pathway is very low.
2.	The number of NADPH molecules produced in the pathway is very low.
3.	The synthesis of sugars in the pathway requires a large input of ATP energy.
4.	There is neither synthesis of sugars, nor of ATP in the pathway.

109 The greatest problem with photorespiration is faced by:

1.	C_4 plants	2.	C_3 plants
3.	CAM plants	4.	purple sulfur bacteria

110 The process of photosynthesis has lower efficiency if photorespiration occurs because of the reduced formation of:

1.	AcetylCoA	2.	3-phosphoglycerate
3.	ATP	4.	RuBP

111 Consider the given two statements:

Statement I:	In C_4 plants, photorespiration does not occur.
Statement II:	C_4 plants do not have RuBisCO in any of their cells.

1.	Both **Statement I** and **Statement II** are correct and **Statement II** explains **Statement I**
2.	Both **Statement I** and **Statement II** are correct but **Statement II** does not explain **Statement I**
3.	**Statement I** is correct but **Statement II** is incorrect
4.	**Statement I** is incorrect but **Statement II** is correct

112 Consider the two statements:

Statement I:	In C_4 plants, photorespiration does not occur.
Statement II:	C_4 plants have a mechanism that increases the concentration of CO_2 at the RuBisCO enzyme site.

1.	**Statement I** is correct; **Statement II** is correct
2.	**Statement I** is incorrect; **Statement II** is correct
3.	**Statement I** is correct; **Statement II** is incorrect
4.	**Statement I** is incorrect; **Statement II** is incorrect

113 What will not be true for C_4 plants when compared to C_3 plants?

1. They have a special type of leaf anatomy
2. They tolerate higher temperatures
3. They show a response to very low light intensities
4. They lack a process called photorespiration

114

Assertion (A):	Photorespiration decreases the efficiency of photosynthesis in plants.
Reason (R):	Carbon dioxide is released during photorespiration, which represents a loss of fixed carbon.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	Both **(A)** and **(R)** are True and **(R)** does not correctly explain **(A)**.
3.	**(A)** is True; **(R)** is False
4.	Both **(A)** and **(R)** are False

FACTORS AFFECTING PHOTOSYNTHESIS

115 The factors that can be limiting for the light independent reactions of photosynthesis are:

1. CO_2, temperature, and light
2. CO_2, light, and water
3. water, temperature, and CO_2
4. oxygen, water, and temperature

116 Except for plants in shade or in dense forests, light is rarely a limiting factor in nature. This is because:

1.	Dark reactions do not depend on light
2.	The rate of photosynthesis can be increased by higher carbon dioxide and lower temperatures even in low light conditions
3.	Light saturation occurs at 10 % of full sunlight
4.	Carbon fixation is independent of enzymes

117 Consider the given two statements:

Statement I:	Despite the presence of a green leaf, optimal light and carbon dioxide conditions, the plant may not photosynthesize if the temperature is very low.
Statement II:	If a chemical process is affected by more than one factor, then its rate will be determined by the factor which is nearest to its minimal value.

1.	Both **Statement I** and **Statement II** are correct and **Statement II** explains **Statement I**
2.	Both **Statement I** and **Statement II** are correct but **Statement II** does not explain **Statement I**
3.	**Statement I** is correct but **Statement II** is incorrect
4.	**Statement I** is incorrect but **Statement II** is correct

118 Consider the given two statements:

Statement I:	Green house crops such as tomatoes and bell pepper are allowed to grow in carbon dioxide enriched atmosphere. This leads to higher yields.
Statement II:	C_3 plants respond to higher carbon dioxide concentration by showing increased rates of photosynthesis, leading to higher productivity.

1.	Both **Statement I** and **Statement II** are correct and **Statement II** explains **Statement I**
2.	Both **Statement I** and **Statement II** are correct but **Statement II** does not explain **Statement I**
3.	**Statement I** is correct but **Statement II** is incorrect
4.	**Statement I** is incorrect but **Statement II** is correct

119 What percentage in atmosphere of carbon dioxide can become damaging to plants over long periods?

1.	0.03 to 0.04	2.	0.04 to 0.05
3.	0.05	4.	more than 0.05

120 Consider the given two statements:

Assertion (A):	Photosynthesis cannot be carried out in higher plants at very high temperatures.
Reason (R):	Carbon fixation is an enzyme mediated process and the enzymes would be denatured at very high temperatures.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A).**
2.	**(A)** is True; **(R)** is False
3.	**(A)** is False; **(R)** is False
4.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.

121 A plant is growing in an open field during a hot summer day. Which of the following limiting factor will have the greatest effect on photosynthesis carried out by this plant?

1. Carbon dioxide concentration
2. Light intensity
3. Temperature
4. Oxygen

122 Consider the two statements:

Statement I:	Current availability of CO_2 levels is limiting to the C_3 plants.
Statement II:	C_3 plants show saturation at about $360\ \mu l L^{-1}$

1.	**Statement I** is correct; **Statement II** is correct
2.	**Statement I** is incorrect; **Statement II** is correct
3.	**Statement I** is correct; **Statement II** is incorrect
4.	**Statement I** is incorrect; **Statement II** is incorrect

PHOTOSYNTHESIS IN HIGHER PLANTS

123 Consider the given two statements:

Assertion(A):	The dark reactions of photosynthesis are temperature controlled.
Reason (R):	The dark reactions of photosynthesis are enzymatic.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	Both **(A)** and **(R)** are False.

124 Consider the given two statements:

Assertion (A):	The effect of water as a factor is more indirect rather than direct on photosynthesis.
Reason (R):	Water is one of the reactants in the light reaction.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	Both **(A)** and **(R)** are False.

125 Consider the given two statements:

Statement I:	At low light conditions, both C_3 and C_4 plants respond to high CO_2 conditions.
Statement II:	At high light intensities, both C_3 and C_4 plants show increase in the rates of photosynthesis.

1.	**Statement I** is correct; **Statement II** is correct
2.	**Statement I** is correct; **Statement II** is incorrect
3.	**Statement I** is incorrect; **Statement II** is correct
4.	**Statement I** is incorrect; **Statement II** is incorrect

126 Regarding the temperature optimum for photosynthesis of different plants:

I:	Tropical plants have a lower temperature optimum than the plants adapted to temperate climates.
II:	The C_4 plants respond to higher temperatures and show higher rate of photosynthesis while C_3 plants have a much lower temperature optimum.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

127 Consider the given two statements:

Assertion:	The alignment of the chloroplasts along the walls of the mesophyll cells vary depending on the amount of incident light.
Reason:	The alignment of the chloroplasts along the walls of the mesophyll cells is such that they get the optimum quantity of the incident light.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	Both **(A)** and **(R)** are False.

128 Of the PAR [photosynthetically active radiation], which light range is least effective in photosynthesis?

1.	380 – 450 nm	2.	450 – 470 nm
3.	495–570 nm	4.	660 – 700 nm

129 Consider the given two statements.

Assertion (A):	A plant with C_4 pathway has a tremendous advantage over a plant with C_3 pathway when the weather is hot and dry.
Reason (R):	The stomata remain open and there is always sufficient carbon dioxide to combine directly with RUBP in C_4 plants when the weather is hot and dry.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**
2.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**
3.	**(A)** is True, **(R)** is False
4.	**(A)** is False, **(R)** is True

130 Which of the following is not a factor that directly affects the rate of photosynthesis?

1. Concentration of chlorophyll
2. Soil fertility
3. Light intensity
4. Temperature

131 Consider the given two statements:

Assertion (A):	The rate of photosynthesis increases with light intensity up to a certain point.
Reason (R):	Chlorophyll can only absorb a limited amount of light energy at a time.

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	Both **(A)** and **(R)** are False.

132 What is not true regarding the factors affecting the rate of photosynthesis?

1.	There is a linear relationship between incident light and carbon dioxide fixation rates at low light intensities.
2.	Current availability of carbon dioxide levels is limiting to the C4 plants.
3.	C4 plants respond to higher temperatures and show higher rates of photosynthesis
4.	Water stress causes the stomata to close, hence reducing the availability of carbon dioxide

PHOTOSYNTHESIS IN HIGHER PLANTS - ANSWER KEY

1.	(3)	2.	(4)	3.	(1)	4.	(1)	5.	(2)	6.	(2)	7.	(4)	8.	(3)	9.	(1)	10.	(2)
11.	(4)	12.	(3)	13.	(1)	14.	(2)	15.	(1)	16.	(3)	17.	(4)	18.	(3)	19.	(1)	20.	(1)
21.	(2)	22.	(1)	23.	(4)	24.	(4)	25.	(1)	26.	(2)	27.	(3)	28.	(2)	29.	(2)	30.	(4)
31.	(1)	32.	(2)	33.	(2)	34.	(3)	35.	(2)	36.	(4)	37.	(4)	38.	(3)	39.	(1)	40.	(2)
41.	(2)	42.	(4)	43.	(2)	44.	(3)	45.	(3)	46.	(2)	47.	(4)	48.	(3)	49.	(3)	50.	(2)
51.	(1)	52.	(1)	53.	(3)	54.	(3)	55.	(2)	56.	(4)	57.	(1)	58.	(2)	59.	(2)	60.	(1)
61.	(4)	62.	(2)	63.	(1)	64.	(1)	65.	(3)	66.	(1)	67.	(2)	68.	(1)	69.	(1)	70.	(4)
71.	(1)	72.	(4)	73.	(3)	74.	(3)	75.	(3)	76.	(3)	77.	(4)	78.	(4)	79.	(1)	80.	(2)
81.	(2)	82.	(2)	83.	(3)	84.	(3)	85.	(1)	86.	(4)	87.	(3)	88.	(4)	89.	(2)	90.	(1)
91.	(1)	92.	(1)	93.	(1)	94.	(1)	95.	(3)	96.	(3)	97.	(2)	98.	(3)	99.	(1)	100.	(1)
101.	(3)	102.	(3)	103.	(2)	104.	(3)	105.	(4)	106.	(2)	107.	(1)	108.	(4)	109.	(2)	110.	(2)
111.	(3)	112.	(1)	113.	(3)	114.	(1)	115.	(1)	116.	(3)	117.	(1)	118.	(1)	119.	(4)	120.	(1)
121.	(1)	122.	(3)	123.	(1)	124.	(2)	125.	(3)	126.	(2)	127.	(1)	128.	(3)	129.	(3)	130.	(2)
131.	(2)	132.	(2)																

RESPIRATION IN PLANTS

INTRODUCTION

1 Cellular respiration includes:

I:	Transport of gases from the respiratory surface to the cells
II:	Breakdown of food material within the cell to release energy
III:	Trapping of energy released during the breakdown of food material within the cell for synthesis of ATP

1.	Only **I** and **II**	2.	Only **I** and **III**
3.	Only **II** and **III**	4.	**I, II** and **III**

2 Consider the two statements:

I:	ATP is used as the energy currency of the cell.
II:	ATP molecule has two high energy bonds.

1. Both **I** and **II** are correct and **II** explains **I**
2. Both **I** and **II** are correct but **II** does not explain **I**
3. **I** is correct but **II** is incorrect
4. **I** is incorrect but **II** is correct

3 Energy released by oxidation in respiration:

1. can use only carbohydrates as respiratory substrate
2. is all released free into the cell
3. is all released in a single step
4. cannot be used directly

4 Consider the given two statements:

Assertion (A):	During oxidation within a cell, all the energy contained in respiratory substrates is released free into the cell, in a single step.
Reason (R):	The energy released by oxidation in respiration is not (or rather cannot be) used directly but is used to synthesise ATP.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	**(A)** is False but **(R)** is True.

5 Plants can get along without respiratory organs. The reasons for this will include all the following except:

1.	Each plant part takes care of its own gas-exchange needs.
2.	Plants present great demands for gas exchange.
3.	The distance that gases must diffuse even in large, bulky plants is not great.
4.	Each living cell in a plant is located quite close to the surface of the plant.

6 Which of the following have the capability and enzymatic machinery to achieve partial oxidation of glucose without the help of oxygen?

1. All living organisms
2. All prokaryotes only
3. Only obligate anaerobes and all prokaryotes
4. Only facultative and obligate anaerobes

7 Consider the two statements:

Statement I:	Inside a cell, the glucose molecule is oxidised not in one step but in several small steps.
Statement II:	Some steps will be just large enough such that energy liberated can be coupled to ATP synthesis.

1.	Both **Statement I** and **Statement II** are correct and **Statement II** explains **Statement I**
2.	Both **Statement I** and **Statement II** are correct but **Statement II** does not explain **Statement I**
3.	**Statement I** is correct but **Statement II** is incorrect
4.	**Statement I** is incorrect but **Statement II** is correct

GLYCOLYSIS

8 Sucrose is converted into glucose and fructose by the enzyme:

1. Sucrase	2. Aldolase
3. Invertase	4. Zymase

9 Consider the given two statements:

Assertion (A):	Glycolysis occurs in the cytoplasm of plant cells.
Reason (R):	Glycolysis does not require oxygen, making it an anaerobic process.

1. Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2. Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**
3. **(A)** is True but **(R)** is False.
4. **(A)** is False but **(R)** is True.

10 Which of the following will be true for glycolysis?

A:	ATP production takes place by substrate-level phosphorylation.
B:	ATP is used and produced.
C:	The end products are carbon dioxide and water.

1. Only **A** and **B**
2. Only **A** and **C**
3. Only **B** and **C**
4. **A**, **B**, and **C**

11 A eukaryotic cell respires aerobically and uses glucose as the respiratory substrate. Which of the following steps in the process will take place in the cytoplasm of the cell?

1. glycolysis
2. Krebs cycle
3. electron transport system
4. transition reaction

12 Phosphorylation of glucose during glycolysis is catalysed by

1. Phosphoglucomutase	2. Phosphoglucoisomerase
3. Hexokinase	4. Phosphorylase

13 The number of metabolic steps in EMP pathway where glucose undergoes partial oxidation to form two molecules of pyruvic acid is:

1. 8	2. 9
3. 10	4. 11

14 What is the end product of glycolysis?

1. NADH	2. ATP
3. G3P	4. Pyruvate

15 In glycolysis, ATP is synthesised:

1. during conversion of 1,3 biphosphoglyceric acid to 3-phosphoglyceric acid and during conversion of phosphoenolpuruvate to pyruvic acid
2. during conversion of glucose to glucose-6-phospate and during conversion of fructose-6-phosphate to fructose – 1,6- biphosphate
3. during conversion of glucose to glucose-6-phospate and during conversion of glucose-6-phosphate to fructose-6- phosphate
4. during conversion of 3-phosphoglyceric acid to 2-phosphoglycerate and during conversion of 2-phosphoglycerate to phosphoenolpuruvate

16 The net gain of number of ATP molecules during glycolysis will be:

1. 2	2. 4
3. 6	4. 8

17 In glycolysis, NAD^+ is reduced to $NADH + H^+$:

1. during conversion of 1,3 biphosphoglyceric acid to 3-phosphoglyceric acid
2. during conversion of glyceraldehyde -3-phosphate to 1,3 biphosphoglyceric acid
3. during conversion of glucose to glucose-6-phospate
4. during conversion of 3-phosphoglyceric acid to 2-phosphoglycerate

18 The net number of ATP and NADH molecules produced because of glycolysis of one glucose molecule respectively will be:

1. 2 and 2
2. 2 and 4
3. 4 and 2
4. 4 and 4

19 A molecule of ATP is produced in glycolysis during:

I:	The conversion of glucose into glucose 6-phosphate.
II:	The conversion of fructose 6-phosphate to fructose 1, 6-bisphosphate.

1. Only **I**
2. Only **II**
3. Both **I** and **II**
4. Neither **I** nor **II**

20 What would be true for glycolysis in cellular respiration?

I:	ATP is produced
II:	ATP is used
III:	Glucose is partially oxidised

1. **I** and **II** only
2. **I** and **III** only
3. **II** and **III** only
4. **I, II** and **III**

21 That glycolysis is an ancient metabolic process is evidenced in the fact that:
1. it yields large number of ATP molecules
2. it does not directly use oxygen
3. it occurs virtually in all cells
4. it takes place in the cytoplasm

22 The number of oxygen molecules used and carbon dioxide produced during the glycolysis pathway, respectively, are :

1.	0 and 0	2.	1 and 1
3.	3 and 3	4.	6 and 6

23 Two phosphorylation steps lead to formation of fructose 1,6 biphosphate from glucose in the first three steps of glycolysis. What is the source of phosphate being used?
1. phospholipids of cell membranes
2. ATP
3. inorganic phosphate from the cytosol
4. ADP

24 How many ATP molecules are directly synthesised in the glycolytic pathway from one glucose molecule?
1. 2
2. 4
3. 10
4. 30

25 What is the number of NADH molecules produced during the metabolic conversion of one molecule of glucose to two molecules of pyruvic acid by glycolytic pathway?
1. 1
2. 2
3. 3
4. 4

26 The correct chronological sequence of the stages of the glycolytic pathway is:

1.	glucose priming, cleavage and rearrangement, oxidation, ATP generation
2.	cleavage and rearrangement, glucose priming, ATP generation, oxidation
3.	glucose priming, oxidation, cleavage and rearrangement, ATP generation
4.	ATP generation, oxidation, glucose priming, cleavage and rearrangement

27 With respect to the steps of glycolysis at which utilization or synthesis of ATP or NADH takes place, Identify the incorrect match:

1.	Production of ATP	BPGA to 3-PGA
2.	Utilization of ATP	Fructose-6-phosphate to Fructose-1,6-biphosphate
3.	Production of NADH	PGAL to BPGA
4.	Utilization of NADH	3-PGA to 2-PGA

FERMENTATION

28 Consider the given two statements:

Assertion (A):	Fermentation is a type of anaerobic respiration where glucose is partially oxidized to produce energy.
Reason (R):	Fermentation results in the production of ethanol or lactic acid without the use of oxygen.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
3.	**(A)** is True, **(R)** is False.
4.	**(A)** is False, **(R)** is True.

29 The maximum concentration of alcohol in beverages that are naturally fermented is about:

1. 5 – 8 %	2. 13 – 15 %
3. 33 – 34 %	4. 47 – 49 %

30 What is the number of ATP molecules produced when pyruvate is converted to lactate by fermentation?

1. 0	2. 2
3. 4	4. 38

31 Consider the given statements:

Statement I:	In alcohol fermentation in yeast, pyruvic acid decarboxylase and alcohol dehydrogenase convert pyruvic acid to carbon dioxide and ethanol.
Statement II:	In lactic acid fermentation, lactate dehydrogenase reduces pyruvic acid to lactic acid and carbon dioxide in muscle cells during exercise.

1.	Both **Statement I** and **Statement II** are correct
2.	Both **Statement I** and **Statement II** are incorrect
3.	**Statement I** is correct but **Statement II** is incorrect
4.	**Statement I** is incorrect but **Statement II** is correct

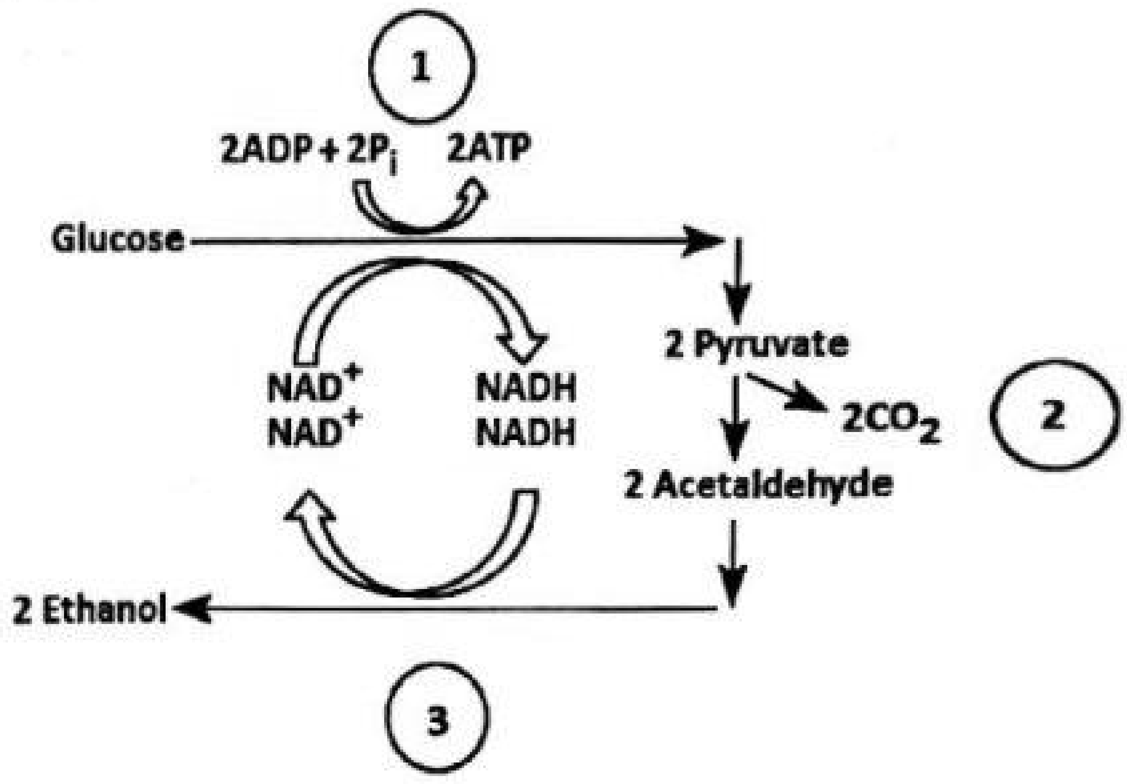
32 The products of fermentation do not include:

1.	CO_2	2.	O_2
3.	ethanol	4.	lactate

33 Carbon dioxide is released during:

1. Lactic acid fermentation
2. Ethanol fermentation
3. Glycolysis
4. Hydrolysis of starch into glucose

34 The reaction 2 in the given figure is catalysed by the enzyme:



1. Pyruvate decarboxylase
2. Pyruvate kinase
3. Pyruvate dehydrogenase
4. Pyruvate synthetase

35 Fermentation is important as it regenerates:

1. O_2
2. NAD^+
3. acetyl-CoA
4. ATP

36 The number of oxygen molecules required in the fermentation of one molecule of glucose to ethanol and carbon dioxide is/are:

1. 0
2. 1
3. 2
4. 6

37 In lactic acid and alcohol fermentation:

I:	less than 7 percent of energy in glucose is released.
II:	all energy released is trapped as high energy bonds of ATP.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

38 In lactate fermentation, the final electron acceptor is:

1.	NAD^+	2.	pyruvate
3.	O_2	4.	lactic acid

39 When oxygen is not available to a cell, NADH formed during glycolysis:

1.	does not undergo any change as there is no need for the cell to regenerate NAD+
2.	passes electrons to the electron transport system
3.	passes hydrogen atoms to pyruvic acid
4.	passes electrons and hydrogen atoms to acetyl coA

AEROBIC RESPIRATION

40 The crucial events in aerobic respiration are:

A:	The partial oxidation of pyruvate by the stepwise removal of all the hydrogen atoms, leaving six molecules of CO_2.
B:	The passing on of the electrons removed as part of the hydrogen atoms to molecular O_2 with simultaneous synthesis of ATP.

1. Only **A** is correct
2. Only **B** is correct
3. Both **A** and **B** are correct
4. Both **A** and **B** are incorrect

41 For aerobic respiration to take place within the mitochondria, the final product of glycolysis, pyruvate:

1.	is transported from the cytoplasm into the mitochondria.
2.	undergoes oxidative decarboxylation in the cytosol.
3.	is reduced to lactate in liver.
4.	is transported from the cytoplasm first into the Golgi apparatus, where it is packaged and then transported into the mitochondrion.

42 Oxidative decarboxylation of pyruvate produces:

1. CO_2	2. Citrate
3. Acetyl-CoA	4. G3P

43 During aerobic respiration, the complete oxidation of pyruvate by the stepwise removal of all the hydrogen atoms, leaving three molecules of carbon dioxide, takes place in the:

1. Cytosol
2. Mitochondrial matrix
3. Mitochondrial inter-membrane space
4. Inner mitochondrial membrane

44 Pyruvate, which is formed by the glycolytic catabolism of carbohydrates in the cytosol:

1.	undergoes oxidative decarboxylation in cytosol itself by a complex set of reactions catalysed by pyruvic kinase.
2.	undergoes reduction in cytosol itself by a complex set of reactions catalysed by pyruvic dehydrogenase.
3.	undergoes oxidative decarboxylation in mitochondrial matrix by a complex set of reactions catalysed by pyruvic dehydrogenase.
4.	undergoes oxidative phosphorylation in mitochondrial matrix by a complex set of reactions catalysed by pyruvic decarboxylase.

45 What occurs during the link reaction in aerobic cellular respiration?

1.	Pyruvate is oxidised to acetyl-CoA and carbon dioxide.
2.	Glucose is phosphorylated twice using ATP.
3.	ATP is synthesized from ADP and inorganic phosphate.
4.	Pyruvate is reduced to acetyl-CoA and carbon dioxide.

46 Pyruvate dehydrogenase activity during aerobic respiration requires:

1.	Calcium	2.	Iron
3.	Cobalt	4.	Magnesium

47 The continued oxidation of acetyl CoA via the TCA cycle requires the continued replenishment of:

I. Oxaloacetic acid	II. NAD^+	III. FAD

1.	I and II only	2.	I and III only
3.	II and III only	4.	I, II and III

48 Pyruvic acid, the key product of glycolysis can have many metabolic fates. Under aerobic condition, it forms

1.	Lactic acid	2.	$CO_2 + H_2O$
3.	Acetyl CoA + CO_2	4.	Ethanol + CO_2

49 During the conversion of pyruvic acid to acetyl CoA in mitochondrial matrix:

I: pyruvic acid is reduced.

II: NAD^+ is oxidized.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

50 Krebs cycle is also called as:

1.	glycolysis	2.	fermentation
3.	Calvin cycle	4.	the citric acid cycle

51 Two successive steps of decarboxylation in the TCA cycle lead to the formation of:

1. α-ketoglutaric acid
2. fumaric acid
3. isocitric acid
4. succinyl-CoA

52 In the citric acid cycle:

1.	oxygen is used to oxidise the acetyl group carbons of acetyl-CoA in the citric acid cycle.
2.	three molecules of NADH and one molecule of $FADH_2$ are produced in one turn.
3.	oxygen is not used, so the cycle can occur in anaerobic conditions.
4.	water is formed during the complete oxidation of glucose.

53 The correct chronology of steps of formation of the given metabolites in TCA cycle is:

1.	Isocitrate – Citrate – Succinyl CoA – α ketoglutarate
2.	Citrate – Isocitrate – Succinyl CoA – α ketoglutarate
3.	Citrate – Isocitrate – α ketoglutarate – Succinyl CoA
4.	Isocitrate – Citrate – α ketoglutarate – Succinyl CoA

54 During the conversion of succinyl CoA to succinic acid in TCA cycle:

1. One molecule of ATP is directly synthesized
2. NAD^+ is reduced
3. FAD is reduced
4. One molecule of GTP is synthesized

55 What is the respective number for NADH and $FADH_2$ produced during one turn of the Krebs' Citric Acid Cycle?

1.	1 and 1	2.	2 and 1
3.	3 and 1	4.	6 and 2

56 At how many points in the TCA cycle is NAD^+ reduced to NADH + H^+?

1.	2	2.	3
3.	4	4.	6

57 The outputs of the Krebs cycle do not include:

1. NADP	2. $FADH_2$
3. ATP	4. CO_2

58 $FADH_2$ is produced in

1.	glycolysis	2.	the oxidation of pyruvate
3.	the Krebs cycle	4.	the electron transport chain

59 After the two molecules of pyruvate, produced at the end of glycolysis from one molecule of glucose, enter the mitochondrial matrix and till the Krebs cycle is complete, which of the following will not be a correct number of the corresponding molecule produced?

1.	Eight molecules of NADH + H^+
2.	Two molecules of $FADH_2$
3.	Two molecules of ATP
4.	Four molecules of carbon dioxide

60 The number of points in the TCA cycle where FAD^+ is reduced to $FADH_2$ is/are:

1. 1
2. 2
3. 3
4. 4

61 Identify the correct statements regarding the mitochondrial electron transport system.

I:	Electrons from NADH in mitochondrial matrix are first transferred to [Fe-S] and then to FMN in complex I.
II:	Complex II is not a proton pump.
III:	Cytochrome c is located on the outer surface of the inner membrane.
IV:	Ubiquinone, located within the inner mitochondrial membrane, is oxidized with the transfer of electrons to cytochrome c via complex III.

1.	Only **II** and **III**	2.	Only **II**, **III** and **IV**
3.	Only **IV**	4.	Only **I** and **III**

62 In the electron transport system in the mitochondria, oxygen acts as a:

I: final acceptor of electrons

II: final acceptor of protons

1.	Only **I**	2.	Only **II**
3.	Both **I** and **II**	4.	Neither **I** nor **II**

63 Ubiquinone is:

1. a protein in the mitochondrial electron transport chain
2. a substrate for synthesis of FADH
3. a vitamin used as coenzyme in Krebs cycle
4. a small hydrophobic coenzyme

64 ATP synthase is located in the mitochondrial:

1.	matrix	2.	electron transport chain
3.	outer membrane	4.	inner membrane

65 ATP synthesis during oxidative phosphorylation in mitochondria is directly driven by:

1. oxidation of glucose.
2. electron transport downhill in the ETC.
3. terminal transfer of electrons to oxygen.
4. chemiosmosis.

66 When electron pass downhill in the ETC, the energy released is used to pump protons into:

1. matrix of mitochondria
2. cytosol
3. mitochondrial inner membrane
4. mitochondrial intermembrane space

67 Consider the given two statements:

Assertion (A):	Presence of oxygen is vital for aerobic cellular respiration
Reason (R):	Oxygen is required in all steps from glycolysis to electron transport involved in aerobic cellular respiration

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**
2.	Both **(A)** and **(R)** are True and **(R)** does not correctly explain **(A)**
3.	**(A)** is True; **(R)** is False
4.	**(A)** is False; **(R)** is True

68 Ubiquinone receives reducing equivalents via:

I. Complex I	II. Complex II	III. Complex III

1.	Only I	2.	Only I and II
3.	Only I and III	4.	I, II and III

69 Cytochrome c is found:

1.	attached to outer surface of the inner mitochondrial membrane
2.	attached to inner surface of the inner mitochondrial membrane
3.	in the inter membrane space
4.	in the mitochondrial matrix

70 The number of ATP molecules synthesized from oxidation of one molecule of NADH and one molecule of $FADH_2$ are respectively:

1.	3 and 2	2.	2 and 3
3.	1 and 1	4.	2 and 1

71 Oxygen drives the process of ATP production via ETS. The best explanation for this would be that oxygen:
1. is needed at the end of the aerobic respiration
2. is the terminal electron donor
3. is not required in the glycolytic pathway
4. acts as the final hydrogen acceptor

72 The stage of cellular respiration that directly involves oxygen is:

1.	glycolysis
2.	at the end of ETC
3.	Krebs cycle
4.	the phosphorylation of ADP to form ATP

73 What process in aerobic respiration generates maximum ATP?

1.	substrate-level phosphorylation	2.	chemiosmosis
3.	Krebs cycle	4.	Pyruvate decarboxylation

74 The components of the mitochondrial electron transport chain are located:
1. in mitochondrial matrix
2. in outer mitochondrial membrane
3. in inner mitochondrial membrane
4. in intermembrane space

75 The correct sequence of flow of electrons downhill in the mitochondrial electron transport chain would be:
1. ubiquinone, cytochromes, FMN, Fe-S
2. cytochromes, FMN, ubiquinone, Fe-S
3. Fe-S, FMN, cytochromes, ubiquinone
4. FMN, Fe-S, ubiquinone, cytochromes

76 Identify the incorrectly matched pair:

	Component of ETC	Name
1.	Complex I	NADH dehydrogenase
2.	Complex II	Succinate dehydrogenase
3.	Complex III	Cytochrome b_6f complex
4.	Complex IV	Cytochrome c oxidase

77 Consider the following statements regarding ATP synthase, complex V of the mitochondrial electron transport system:

I:	The F_1 headpiece is peripheral membrane protein complex and contains the site for the synthesis of ATP from ADP and inorganic phosphate.
II:	The F_0 is an integral membrane protein complex that forms the channel through which protons cross the inner membrane.
III:	For each ATP produced, $4H^+$ passes through F_0 from the intermembrane space to the matrix down the electrochemical proton gradient.

1. Only **III** is correct
2. Only **I** and **II** are correct
3. **I, II** and **III** are correct
4. **I, II** and **III** are incorrect

78 Which complex in the mitochondrial electron transport system contains cytochromes a and a_3 and two copper centres?

1. Complex I	2. Complex II
3. Complex III	4. Complex IV

79 Identify the incorrectly matched pair:

	Respiratory Complex	Pathway for electron transport
1.	NADH dehydrogenase	NADH – FMN – [Fe-S] – Q
2.	Succinic dehydrogenase	$FADH_2$ – FMN - Q
3.	Cytochrome bc_1	Cyt b – [Fe-S] – Cyt c_1
4.	Cytochrome c oxidase	Cu_A – Cyt a – Cyt a_3 – Cu_B

80 A net gain of how many ATP molecules occurs during aerobic respiration of one molecule of glucose?
1. 30
2. 32
3. 36
4. 38

81 Which enzyme is associated with Complex II of the mitochondrial Electron Transport System?
1. NADH dehydrogenase
2. Succinate dehydrogenase
3. Pyruvate dehydrogenase
4. Malate dehydrogenase

82 In the mitochondrial electron transport chain, Complex IV refers to:
1. NADH dehydrogenase
2. Cytochrome c oxidase complex
3. Ubiquinone
4. ATP synthase

83 All the following are part of mitochondrial electron transport system except:

1.	Cyt b_6f	2.	Cyt C
3.	Cyt bc_1	4.	Cyt aa_3

84 Which of the following is the complex III of the mitochondrial ETS?
1. NADH dehydrogenase
2. Succinic dehydrogenase
3. Cytochrome bc_1 complex
4. Cytochrome c oxidase

85 The reduced ubiquinone (ubiquinol) in the mitochondrial ETS is oxidised with the transfer of electrons to:
1. cytochrome c via succinic dehydrogenase
2. cytochrome c via cytochrome bc_1 complex
3. cytochrome bc_1 via cytochrome aa_3
4. cytochrome bc_1 via cytochrome b_6f

86 Regarding ATP synthase (complex V):

I:	The F_1 headpiece is a peripheral membrane protein complex and contains the site for synthesis of ATP from ADP and inorganic phosphate.
II:	F_0 is an integral membrane protein complex that forms the channel through which protons cross the inner membrane.
III:	The F_0 headpiece is a peripheral membrane protein complex and contains the site for synthesis of ATP from ADP and inorganic phosphate.
IV:	F_1 is an integral membrane protein complex that forms the channel through which protons cross the inner membrane.

1. **I** and **II** are correct
2. **III** and **IV** are correct
3. **I** and **III** are correct
4. **II** and **IV** are correct

87 Consider the given two statements:

Statement I:	Succinate dehydrogenase is an enzyme complex found in the inner mitochondrial membrane of eukaryotes.
Statement II:	Succinate dehydrogenase is the only enzyme that participates in both the citric acid cycle and the electron transport chain.

1. **Statement I** is correct; **Statement II** is correct
2. **Statement I** is incorrect; **Statement II** is correct
3. **Statement I** is correct; **Statement II** is incorrect
4. **Statement I** is incorrect; **Statement II** is incorrect

88 Consider the given two statements:

Assertion (A):	The electron transport chain in plant cells is located in the outer mitochondrial membrane.
Reason (R):	ATP synthesis in mitochondria is directly linked to the gradient of protons formed across the inner mitochondrial membrane.

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	**(A)** is False but **(R)** is True.

THE RESPIRATORY BALANCE SHEET

89 According to NCERT textbook, what is the number of ATP molecules that can be regarded as a net gain during aerobic respiration of one molecule of glucose?

1. 2	2. 30
3. 36	4. 38

90 Correct comparisons between fermentation and aerobic respiration will include:

I:	Fermentation accounts for only a partial breakdown of glucose, whereas in aerobic respiration, it is completely degraded to CO_2 and H_2O.
II:	In fermentation, there is a net gain of only two molecules of ATP for each molecule of glucose degraded to pyruvic acid, whereas many more molecules of ATP are generated under aerobic conditions.
III:	NADH is oxidised to NAD^+ rather slowly in fermentation, however, the reaction is very vigorous in case of aerobic respiration.

1. Only **I** and **II**
2. Only **I** and **III**
3. Only **II** and **III**
4. **I**, **II** and **III**

91 It is possible to make calculations of the net gain of ATP for every glucose molecule oxidised; but in reality this can remain only a theoretical exercise. These calculations can be made only on certain assumptions including all the following except:

1.	There is a sequential, orderly pathway functioning, with one substrate forming the next and with glycolysis, TCA cycle and ETS pathway following one after another.
2.	The NADH synthesised in glycolysis does not get transferred into the mitochondria and does not undergo oxidative phosphorylation.
3.	None of the intermediates in the pathway are utilised to synthesise any other compound.
4.	Only glucose is being respired – no other alternative substrates are entering in the pathway at any of the intermediary stages.

92 The correct comparisons between fermentation and aerobic respiration will include:

	Fermentation	Aerobic respiration
A.	accounts for only a partial breakdown of glucose	glucose is completely degraded to CO_2 and H_2O
B.	there is a net gain of only two molecules of ATP for each molecule of glucose degraded to pyruvic acid	there is a net gain of many more molecules of ATP for each molecule of glucose degraded to pyruvic acid
C.	NADH is oxidised to NAD^+ vigorously	NADH is oxidised to NAD^+rather slowly

1. Only A
2. Only A and B
3. Only B and C
4. A, B and C

AMPHIBOLIC PATHWAY

93 Consider the two statements:

Statement I:	The respiratory pathway is better regarded as an amphibolic pathway rather than only a catabolic pathway.
Statement II:	The respiratory pathway is involved in both anabolism and catabolism.

1.	Both **Statement I** and **Statement II** are correct and **Statement II** explains **Statement I**
2.	Both **Statement I** and **Statement II** are correct but **Statement II** does not explain **Statement I**
3.	**Statement I** is correct but **Statement II** is incorrect
4.	**Statement I** is incorrect but **Statement II** is correct

94 If fatty acids were to enter the respiratory pathway, they must be converted to a molecule with:

1.	Two carbons	2.	Three carbons
3.	Five carbons	4.	Six carbons

95 Consider the following statements:

I:	If fatty acids were to be respired, they would enter the respiratory pathway as acetyl CoA.
II:	Glycerol enters the respiratory pathway after being converted to PGAL.
III:	Amino acids enter the respiratory pathway at some stage within the Krebs cycle but never as pyruvate or acetyl CoA.

1. Only **II** is incorrect
2. Only **III** is incorrect
3. Both **I** and **III** are incorrect
4. **I, II** and **III** are correct

96 The number of correct statements from the given statements regarding possible respiratory substrates is:

I:	Glucose is the favoured substrate for respiration.
II:	All carbohydrates are usually first converted into glucose before they are used for respiration.
III:	Glycerol would enter the pathway after being converted to Acetyl CoA.
IV:	Proteins and amino acids cannot be used as respiratory substrates.

1. 1
2. 2
3. 3
4. 4

RESPIRATORY QUOTIENT

97 When proteins are respiratory substrates, the respiratory quotient is about:

1.	0.7	2.	0.9
3.	1.0	4.	4.0

98 The following equation shows the complete oxidation of tripalmitin [a fatty acid] during cellular respiration. Calculate the RQ:

$$2(C_{51}H_{98}O_6) + 145O_2 \longrightarrow$$

$$102CO_2 + 98H_2O + \text{energy}$$

1.	0.7	2.	0.9
3.	1.0	4.	4.0

99 The correct descending order of the RQ value, when carbohydrates, proteins and fats are used as respiratory substrate would be:

1. Protein > Fats > Carbohydrates
2. Protein > Carbohydrates > Fats
3. Carbohydrates > Protein > Fats
4. Fats > Carbohydrates > Protein

100 Consider the given two statements:

Assertion (A):	When carbohydrates are used as respiratory substrate and are completely oxidised, the RQ will be 1.
Reason (R):	Equal amounts of CO_2 and O_2 are evolved and consumed, when carbohydrates are used as respiratory substrate and are completely oxidised.

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**
3.	**(A)** is True but **(R)** is False
4.	**(A)** is False but **(R)** is True

101 The ratio of the volume of CO_2 evolved to the volume of O_2 consumed in respiration is called as the respiratory quotient [RQ]. Calculate RQ when albumin is used as a respiratory substrate[see the given equation]:

$C_{77}H_{112}N_2O_{22}S + 77O_2 \rightarrow 63\ CO_2 + 38\ H_2O + SO_2 + 9\ CO(NH_2)_2$

1.	0.70	2.	0.82
3.	0.90	4.	1.00

102 The respiratory quotient:

I:	is the ratio of the volume of carbon dioxide evolved to the volume of oxygen evolved
II:	is 1, if carbohydrates are used as respiratory substrates and are completely oxidized

1.	Only **I** is correct
2.	Only **II** is correct
3.	Both **I** and **II** are correct
4.	Both **I** and **II** are incorrect

RESPIRATION IN PLANTS - ANSWER KEY

1.	(3)	2.	(2)	3.	(4)	4.	(4)	5.	(2)	6.	(1)	7.	(1)	8.	(3)	9.	(2)	10.	(1)
11.	(1)	12.	(3)	13.	(3)	14.	(4)	15.	(1)	16.	(1)	17.	(2)	18.	(1)	19.	(4)	20.	(4)
21.	(3)	22.	(1)	23.	(2)	24.	(2)	25.	(2)	26.	(1)	27.	(4)	28.	(2)	29.	(2)	30.	(1)
31.	(3)	32.	(2)	33.	(2)	34.	(1)	35.	(2)	36.	(1)	37.	(1)	38.	(2)	39.	(3)	40.	(2)
41.	(1)	42.	(3)	43.	(2)	44.	(3)	45.	(1)	46.	(4)	47.	(4)	48.	(3)	49.	(4)	50.	(4)
51.	(4)	52.	(2)	53.	(3)	54.	(4)	55.	(3)	56.	(2)	57.	(1)	58.	(3)	59.	(4)	60.	(1)
61.	(1)	62.	(3)	63.	(4)	64.	(4)	65.	(4)	66.	(4)	67.	(3)	68.	(2)	69.	(1)	70.	(1)
71.	(4)	72.	(2)	73.	(2)	74.	(3)	75.	(4)	76.	(3)	77.	(2)	78.	(4)	79.	(2)	80.	(4)
81.	(2)	82.	(2)	83.	(1)	84.	(3)	85.	(2)	86.	(1)	87.	(1)	88.	(4)	89.	(4)	90.	(4)
91.	(2)	92.	(1)	93.	(1)	94.	(1)	95.	(2)	96.	(2)	97.	(2)	98.	(1)	99.	(3)	100.	(1)
101.	(2)	102.	(3)																

PLANT GROWTH AND DEVELOPMENT

GROWTH

1 NCERT textbook says that plant growth is unique. What is the character of plant growth being referred to?
1. Plants have a closed growth
2. Capacity of unlimited growth throughout life
3. Complete absence of growth after a certain age
4. Growth without development

2 Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R):

Assertion (A):	Plants retain the capacity for unlimited growth throughout their life.
Reason (R):	Plants have meristems at certain locations in their body.

In the light of the above statements choose the correct answer from the options given below:

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	Both **(A)** and **(R)** are False.

3 Consider the given two statements:

Assertion (A):	Unlike animals, plants retain the capacity for unlimited growth throughout their life.
Reason (R):	Unlike animals, there is presence of meristems at certain locations in their body.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	**(A)** is True; **(R)** is False
3.	**(A)** is False; **(R)** is False
4.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.

4 The form of growth wherein new cells are always being added to the plant body by the activity of the meristem is called the:
1. closed form of growth.
2. open form of growth.
3. determinate form of growth
4. positive form of growth.

5 Which of the following, principally, contribute to the elongation of the plants along their axis?

I:	Root apical meristem
II:	Shoot apical meristem
III:	Vascular cambium
IV:	Cork-cambium

1. Only **I** and **II**
2. Only **III** and **IV**
3. Only **I** and **III**
4. Only **II** and **IV**

6 Consider the given two statements:

Statement I:	The root apical meristem and the shoot apical meristem are responsible for the primary growth of the plants and cause the increase in the girth of the organs in which they are active.
Statement II:	In dicotyledonous plants and gymnosperms, the lateral meristems, vascular cambium and cork-cambium principally contribute to the elongation of the plants along their axis.

1. **Statement I** is correct; **Statement II** is incorrect
2. **Statement I** is correct; **Statement II** is correct
3. **Statement I** is incorrect; **Statement II** is incorrect
4. **Statement I** is incorrect; **Statement II** is correct

7 Identify the incorrect statement:

1.	Growth is primarily expressed as increase in number of cells at the root apical meristem in maize.
2.	Growth is primarily represented as increase in size of cells in watermelons.
3.	Growth of a pollen tube is measured in terms of its girth.
4.	An increase in surface area denotes the growth in a dorsiventral leaf.

8 Consider the given two statements:

Assertion (A):	Growth, at the cellular level, is measured by a variety of parameters, some of which are: increase in fresh weight, dry weight, length, area, volume and cell number.
Reason (R):	Growth, at a cellular level, is principally a consequence of an increase in the amount of protoplasm, and increase in protoplasm is difficult to measure directly.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
3.	**(A)** is True; **(R)** is False.
4.	**(A)** is False; **(R)** is True.

9 Match Column I [phase of growth] and Column II [cell characteristics] and choose the correct answer from the codes given:

	Column I		**Column II**
A.	Meristematic	a.	Increased vacuolation, new cell wall deposition
B.	Elongation	b.	Thin cellulosic wall with abundant plasmodesmatal connections
C.	Maturation	c.	Maximal wall thickening

Codes

	A	B	C
1.	a	b	c
2.	b	c	a
3.	b	a	c
4.	c	b	a

10 What would not be true for the cells in the meristematic region at the root apex?

1.	They are constantly dividing cells.
2.	They are rich in protoplasm, possess large conspicuous nuclei.
3.	Their cell walls are primary in nature.
4.	Plasmodesmatal connections between the cells are absent.

11 The cells in the region of elongation at the root apex are not characterised by:

1.	Increased vacuolation	2.	Cell enlargement
3.	Constant division	4.	New cell wall deposition

12 The cells of which zone at the root apex attain their maximal size in terms of wall thickening and protoplasmic modifications?

1. Root cap
2. Meristematic zone
3. Elongation zone
4. Maturation zone

13 Identify the incorrect statement regarding the arithmetic growth?

1.	Following mitosis, both daughter cells continue to divide
2.	Can be exemplified by root elongating at a constant rate
3.	On plotting the length of the organ against time, a linear curve is obtained
4.	Mathematically it is expressed as $L_t = L_0 + rt$

14 Consider the given two statements:

Statement I:	In geometric growth, following mitotic cell division, only one daughter cell continues to divide while the other differentiates and matures.
Statement II:	In arithmetic growth, both the progeny cells following mitotic cell division retain the ability to divide and continue to do so.

1. **Statement I** is correct; **Statement II** is incorrect
2. **Statement I** is correct; **Statement II** is correct
3. **Statement I** is incorrect; **Statement II** is incorrect
4. **Statement I** is incorrect; **Statement II** is correct

15 The difference between arithmetic and geometric growth in plants is that:

1. Arithmetic growth involves an increase in size only, while geometric growth involves an increase in number
2. In arithmetic growth, one daughter cell continues to divide, while in geometric growth, both do
3. Arithmetic growth is exponential, while geometric growth is linear
4. Geometric growth involves cell division and enlargement, while arithmetic growth involves only division

16 The shape of the growth curve characteristic of a living organism growing in natural environment is:

1.	Linear	2.	Sigmoid
3.	Hyperbola	4.	Bell shaped

17 Consider the given two statements:

Assertion (A):	A sigmoid curve is a characteristic of living organism growing in a natural environment.
Reason (R):	It is typical for all cells, tissues and organs of a plant.

1. Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2. Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
3. **(A)** is True; **(R)** is False.
4. **(A)** is False; **(R)** is True.

18 The exponential growth in plants can be expressed as: $W_1 = W_0e^{rt}$ where 'e' denotes:

1. Initial size at the beginning of the period
2. base of natural logarithms
3. growth rate/elongation per unit time
4. time of growth

19 Mathematically, arithmetic growth in plants is expressed as:

1.	$L_t = L_0 + rt$	2.	$L_t = L_0 X rt$
3.	$L_t = L_0 / rt$	4.	$Lt = L_0 - rt$

20 Quantitative comparisons between the growth of living system can be made in two ways where:

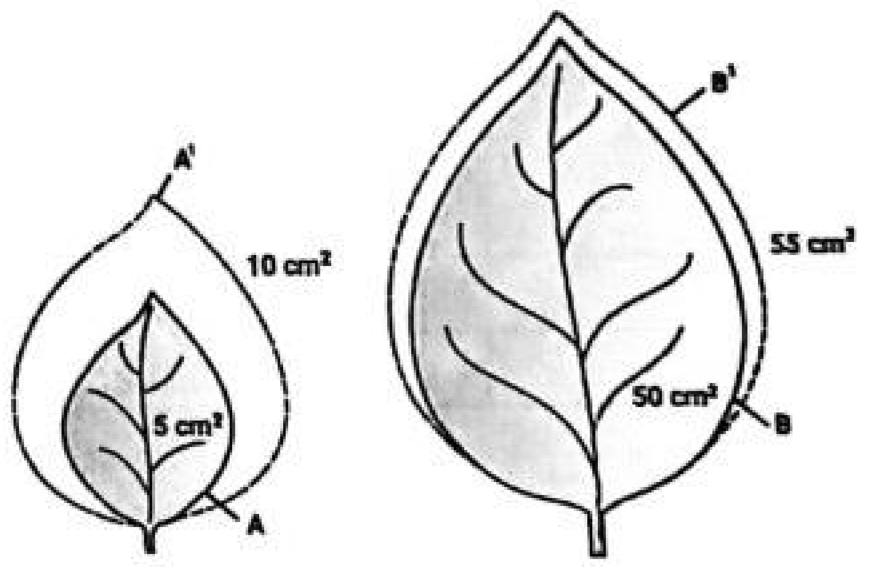
I:	measurement and the comparison of total growth per unit time is called the absolute growth rate.
II:	the growth of the given system per unit time expressed on a common basis, e.g., per unit initial parameter is called the relative growth rate.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

21 The efficiency index in the geometric growth equation $W_1 = W_0 e^{rt}$ is denoted by:

1. W_0
2. W_1
3. r
4. e

22 Consider the given diagram and select the correct inference:



1. Both leaves have shown different absolute growths
2. First leaf has exhibited growth but second leaf has not as it is already senescent
3. The relative growth of first leaf is more than that of the second leaf
4. Both leaves have exhibited equal relative growths

23 Plant growth and further development is intimately linked to water status of the plant because:

A. Turgidity of cells helps in extension growth
B. It provides medium for enzymatic activity
1. Both A and B are correct
2. Only A is correct
3. Only B is correct
4. Both A and B are incorrect

24 In plants, during growth and development:

I:	Turgidity of cells helps in extension growth.
II:	Water provides the medium for enzymatic activities needed for growth.
III:	Oxygen helps in releasing metabolic energy essential for growth activities.
IV:	Nutrients (macro and micro essential elements) are required for the synthesis of protoplasm and act as source of energy.

1. Only **I, II** and **III** are correct
2. Only **I, III** and **IV** are correct
3. Only **II, III** and **IV** are correct
4. **I, II, III** and **IV** are correct

25 The optimum temperature range for proper growth in most plants is:

1.	$0°C - 100°C$	2.	$15°C - 20°C$
3.	$28°C - 30°C$	4.	Greater than $45°C$

DIFFERENTIATION, DEDIFFERENTIATION, REDIFFERENTIATION

26 Consider the given two statements:

I:	Differentiation in plants is open.
II:	Cells/tissues arising out of the same meristem have different structures at maturity.

1. Both **I** and **II** are correct and **II** explains **I**
2. Both **I** and **II** are correct but **II** does not explain **I**
3. **I** is correct but **II** is incorrect
4. **I** is incorrect but **II** is correct

27 In plants, the living differentiated cells, have lost the capacity of division under certain conditions. This phenomenon is termed as:

1.	Dedifferentiation	2.	Proto-differentiation
3.	Redifferentiation	4.	Secondary differentiation

28 Formation of interfascicular cambium and cork cambium in certain plants is an example of:

1.	Differentiation	2.	De-differentiation
3.	Re-differentiation	4.	Anti-differentiation

29 Which of the following is not formed as result of re-differentiation in plants?

1. Cork cambium
2. Phellem
3. Periderm
4. Secondary xylem

30 Which of the following correctly pairs the process with an example?

A.	Differentiation	-	The formation of xylem and phloem from meristematic tissue
B.	Dedifferentiation	-	Formation of secondary xylem

1. Only **A** is correct
2. Only **B** is correct
3. Both **A** and **B** are correct
4. Neither **A** nor **B** is correct

31 When a cell in plants differentiates to form a tracheary element:

I:	it would gain a lot of protoplasm.
II:	it develops a very strong, elastic, lignocellulosic secondary cell walls.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

32 The examples of de-differentiation in plants include:

I:	Formation of a tumour.
II:	Parenchyma cells made to divide under controlled laboratory conditions during plant tissue culture.

1.	Only I	2.	Only II
3.	Both I and II	4.	Neither I nor II

DEVELOPMENT

33 Development is a term that includes all changes that a plant goes through during its life cycle:

1. till germination of the seed
2. during its vegetative growth
3. from germination till flowering
4. from germination to senescence

34 Difference in shapes of leaves produced in air and those produced in water represents heterophyllous development due to environment in:

1.	Cotton	2.	Coriander
3.	Larkspur	4.	Butter cup

35 Plants follow different pathways in response to environment or phases of life to form different kinds of structures. This ability is called:

1.	Plasticity	2.	Norm of the reaction
3.	Development noise	4.	Acclimatisation

36 Consider the given two statements:

Statement I:	In cotton, coriander, and larkspur, differences in the shapes of leaves produced in air and those produced in water represent heterophyllous development due to environment.
Statement II:	In buttercup, the leaves of the juvenile plant are different in shape from those in mature plants.

1. Statement I is correct; Statement II is incorrect
2. Statement I is correct; Statement II is correct
3. Statement I is incorrect; Statement II is incorrect
4. Statement I is incorrect; Statement II is correct

37 Phenotypic Plasticity in plant growth means:

1.	Plant roots are extensible
2.	Plants do not respond to environmental condition around them
3.	Stems can extend
4.	Plants have the ability to produce different phenotypes in response to environmental changes

38 Heterophylly in larkspur is demonstrated by:

1.	Leaves changing shape in response to water availability.
2.	Leaves exhibiting different shapes at various stages of the plant's life cycle.
3.	Leaves altering their color based on sunlight exposure.
4.	Leaves varying in size depending on their position on the plant.

39 Consider the given two statements:

I:	Generally, phenotypic plasticity is more important for immobile organisms (e.g. plants) than mobile organisms (e.g. most animals).
II:	Plants follow different pathways in response to environment or phases of life to form different kinds of structures.

1. Both I and II are correct and II explains I
2. Both I and II are correct but II does not explain I
3. I is correct but II is incorrect
4. Both I and II are incorrect

PLANT GROWTH REGULATORS

40 Identify the incorrectly matched pair:

	PGR	Chemical nature
1.	Auxins	Indole compounds
2.	Cytokinin	Pyrimidine derivatives
3.	ABA	Carotenoid derivative
4.	Gibberellic acid	Terpenes

41 Identify the incorrectly matched pair:

	Scientist	PGR discovery
1.	Cousins	Ethylene
2.	Kurosawa	Gibberellin
3.	Skoog and Miller	ABA
4.	F. W. Went	Auxin

42 Identify the plant growth regulator that, though is largely an inhibitor but, can be placed in both plant growth promoter and plant growth inhibitor groups?

1.	Auxins	2.	Gibberellins
3.	Ethylene	4.	Abscisic acid

43 Identify the correct statements:

I:	Auxins, gibberellins and cytokinins are plant growth promoters.
II:	ABA is an inhibitor of plant growth activities.
III:	Ethylene is largely a plant growth promoter.

1. Only I and II
2. Only I and III
3. Only II and III
4. I, II and III

44 Auxin was isolated from tips of coleoptiles of oat seedlings by:

1. Charles Darwin
2. F. W. Went
3. Boysen and Jensen
4. Francis Darwin

45 The 'bakanae' (foolish seedling) disease of rice seedlings is associated with the discovery of:

1. Auxins
2. Gibberellins
3. Ethylene
4. Abscisic acid

46 The names of Skoog and Miller are associated with the discovery of:

1.	Cytokinins	2.	Ethylene
3.	Jasmonates	4.	GAs

47 F. Skoog and his co-workers observed that from the internodal segments of tobacco stems the callus proliferated only if extracts of vascular tissues or yeast extract or coconut milk or DNA supplements the medium already containing:

1. Auxins
2. Gibberellins
3. Ethylene
4. Kinetins

48 Kinetin was first discovered from:

1.	Herring sperm DNA	2.	Coconut milk
3.	Yeast extract	4.	Corn kernels

49 During mid-1960s, three independent researches reported the purification and chemical characterisation of three different kinds of inhibitors: inhibitor-B, abscission II and dormin. Later all the three were proved to be chemically identical. It was named:

1. Indole-3-acetic acid
2. N6-furfurylamino purine
3. Abscisic acid
4. Gibberellic acid

50 Match the PGR in Column I with their chemical nature in Column II and select the correct match from the codes given:

	Column I		Column II
A.	Auxin	P.	F. W. Went
B.	Gibberellin	Q.	E. Kurosawa
C.	Cytokinin	R.	F. Skoog and co-workers
D.	Ethylene	S.	H. H. Cousins

Codes:

	A	B	C	D
1.	P	Q	R	S
2.	Q	R	S	P
3.	R	S	P	Q
4.	S	P	Q	R

51 Auxin was first isolated from:

1.	Coconut milk	2.	Barley endosperm
3.	Oat coleoptiles	4.	Human urine

52 Consider the given statements:

I:	Auxin was first isolated from human urine.
II:	They are generally produced by the growing apices of the stems and the roots.
III:	IAA and IBA are synthetic auxins.
IV:	NAA and 2,4-D have been isolated from plants.

1. Only **I** and **II** are correct
2. Only **III** and **IV** are correct
3. **I, II** and **IV** are correct
4. **I, II, III** and **IV** are correct

53 During micropropagation, which PGR is used to initiate rooting in stem cuttings?

1.	Gibberellin	2.	Ethylene
3.	Cytokinin	4.	Auxin

54 Auxins:

I:	promote flowering in pineapples
II:	induce parthenocarpy in tomatoes
III:	like 2,4-D kill monocot weeds
IV:	control xylem differentiation

1. Only **I** and **II** are correct
2. Only **III** is incorrect
3. **I, II, III** and **IV** are correct
4. Only **I** and **IV** are incorrect

55 Consider the two statements:

Assertion(A):	Apical dominance is most likely adaptive.
Reason(R):	It is important for the plant to devote energy to growing upward so that it can get more light to undergo photosynthesis.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
3.	**(A)** is True; **(R)** is False.
4.	**(A)** is False; **(R)** is True.

56 Apical dominance is the phenomenon where the main central stem of the plant is dominant over (grows more vigorously than) the other side stems. Which hormone is responsible for apical dominance?

1.	Auxin	2.	Gibberellin
3.	Cytokinin	4.	Ethylene

57 How does pruning help in making the hedge dense?

1.	It induces the differentiation of new shoots from the rootstock
2.	It frees axillary buds from apical dominance
3.	The apical shoots grow faster after pruning
4.	It releases wound hormones

58 Consider the given two statements:

I:	Removal of shoot tips is widely applied in hedge making and tea plantations.
II:	Removal of shoot tips usually results in the growth of lateral buds.

1. Both **I** and **II** are correct and **II** explains **I**
2. Both **I** and **II** are correct but **II** does not explain **I**
3. **I** is correct but **II** is incorrect
4. **I** is incorrect but **II** is correct

59 Auxins:

I: promote flowering in tomatoes.

II: induce parthenocarpy in pineapples.

1.	Only **I**	2.	Only **II**
3.	Both **I** and **II**	4.	Neither **I** nor **II**

60 Consider the given two statements:

Assertion(A):	Synthetic auxin herbicides, including 2,4-dichlorophenoxyacetic acid (2,4-D) have been developed and used for broadleaf weed control.
Reason(R):	Auxins are toxic to plants in large concentrations; they are most toxic to dicots and less so to monocots.

1.	**(A)** is True; **(R)** is False
2.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**
3.	**(A)** is False; **(R)** is True
4.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**

61 One of the first gibberellins to be discovered and also the one that remains the most intensively studied form is:

1. GA_1
2. GA_2
3. GA_3
4. GA_4

62 Consider the two statements:

Assertion (A):	Gibberellins are used to increase the length of grape stalks.
Reason (R):	Gibberellins help overcome apical dominance.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
3.	**(A)** is True; **(R)** is False.
4.	**(A)** is False; **(R)** is True.

63 How many of the following can be characterized as action of gibberellins on plants?

I:	They can be used to increase the length of grape stalks.
II:	They can elongate and improve the shape of apple.
III:	They speed up malting process in brewing industry.
IV:	They hasten the maturity period of juvenile conifers.
V:	They promote bolting in many plants with rosette habit.

1. 2	2. 3
3. 4	4. 5

64 Consider the given two statements:

Assertion (A):	Gibberellins are used for apple shaping.
Reason (R):	Gibberellins stimulate the elongation of apple cells, enhancing their symmetry and size.

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	**(A)** is False but **(R)** is True.

65 To extend their market period, fruits can be left on trees longer by the application of:

1.	Auxin	2.	Gibberellins
3.	Cytokinin	4.	ABA

66 Consider the two statements:

Assertion (A):	GA_3 is used in brewing industry.
Reason (R):	GA_3 speeds up the malting process.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
3.	**(A)** is True; **(R)** is False.
4.	**(A)** is False; **(R)** is True

67 Consider the given two statements:

I:	Spraying sugarcane crop with gibberellins increases the yield by as much as 20 tonnes per acre.
II:	Sugarcane stores carbohydrates as sugar in their stems and spraying sugarcane crop with gibberellins increases the length of the stem.

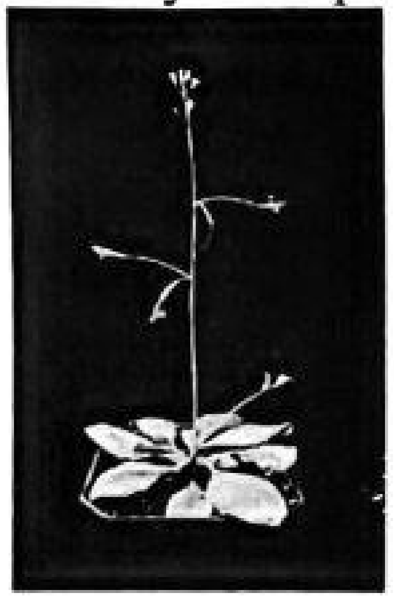
1. Both **I** and **II** are correct and **II** explains **I**
2. Both **I** and **II** are correct but **II** does not explain **I**
3. **I** is correct but **II** is incorrect
4. **I** is incorrect but **II** is correct

68 Consider the two statements:

Assertion(A):	Spraying juvenile conifers with GAs delays seed production.
Reason(R):	Spraying juvenile conifers with GAs delays the onset of maturity period.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
3.	**(A)** is True; **(R)** is False.
4.	**(A)** is False; **(R)** is False.

69 The given picture shows 'bolting' in a plant with rosette habit. What PGR may be responsible for this?



1. ABA
2. GA_3
3. IAA
4. Ethylene

70 Which plant growth regulator (PGR) promotes bolting (internode elongation just prior to flowering) in beet, cabbages and many plants with rosette habits?

1. Auxins
2. Gibberellins
3. Ethylene
4. Kinetins

71 All the following statements regarding cytokinins are true except:

1.	They were discovered as kinetin, a modified form of adenine.
2.	Zeatin was isolated from corn-kernels and coconut milk.
3.	Kinetin occurs widely in almost all plants.
4.	Natural cytokinins are synthesized in region where rapid cell division occurs.

72 Identify the incorrectly matched row:

	PGR	Chemical nature	Discovered by
1.	Auxin	Indole	F. W. Went
2.	Gibberellin	Sphingosines	Yoshinori Ohsumi
3.	Cytokinin	Adenine derivatives	Skoog and Miller
4.	Ethylene	Gaseous	Cousins

73 Consider the given two statements:

Statement I:	Kinetin, a modified form of adenine, a purine, was discovered from the autoclaved herring sperm DNA.
Statement II:	Search for natural substances with cytokinin-like activities led to the isolation of zeatin from corn-kernels and coconut milk.

1. **Statement I** is correct; **Statement II** is incorrect
2. **Statement I** is correct; **Statement II** is correct
3. **Statement I** is incorrect; **Statement II** is correct
4. **Statement I** is incorrect; **Statement II** is incorrect

74 Cytokinins do not help in:

1. Production of new leaves
2. Lateral shoot growth
3. Adventitious shoot formation
4. Promotion of apical dominance

75 Cytokinins help in delay of leaf senescence because they:

1.	Promote new leaves formation
2.	Help overcome apical dominance
3.	Help in chloroplast formation in leaves
4.	Promote nutrient mobilization

76 Cytokinins:

I:	Help produce new leaves, chloroplasts in leaves, lateral shoot growth and adventitious root formation.
II:	Help overcome the apical dominance.
III:	Promote nutrient mobilisation, which helps in the delay of leaf senescence.

1. Only **I** and **II**	2. Only **I** and **III**
3. Only **II** and **III**	4. **I, II** and **III**

77 Apical dominance in plants, largely regulated by auxins, can be overcome by:

1.	IAA	2.	Ethylene
3.	Gibberellin	4.	Cytokinin

78 Which gaseous PGR is synthesised in large amounts by tissues undergoing senescence and ripening fruits

1.	ABA	2.	IAA
3.	Ethylene	4.	GA

79 Which of the following is not a function of ethylene?

1.	Breaking seed and bud dormancy
2.	Horizontal growth of seedlings, swelling of axis and apical hook formation in dicot seedlings
3.	Enhancement of respiration rate during ripening of fruits
4.	Closure of stomata during water stress

80 How many statements regarding Ethylene are true?

I:	It is synthesised in large amounts by tissues undergoing senescence and ripening fruits.
II:	It promotes senescence and abscission of plant organs especially of leaves and flowers.
III:	It enhances the respiration rate during ripening of the fruits.

1. 0
2. 1
3. 2
4. 3

81 Normally, when the seeds are mature, ethylene production increases and builds-up within the fruit, resulting in a climactic event that means:

1.	A sudden spurt of growth	2.	Leaf expansion
3.	Rise in respiratory rate	4.	Death of radicle

82 The documented effects of ethylene on plants include all the following, except:

1.	It breaks seed and bud dormancy
2.	It initiates germination in peanut seeds
3.	It does not allow sprouting of potato tubers
4.	It promotes root growth and root hair formation.

83 All the following are physiological functions of Ethylene in plants except:

1.	It breaks seed and bud dormancy
2.	It delays germination in peanut seeds
3.	It leads to sprouting of potato tubers
4.	It promotes rapid internode/petiole elongation in deep water rice plants

84 Which plant growth regulator (PGR) promotes root growth and root hair formation, thus helping the plants increase their absorption surface?

1. Auxins
2. Gibberellins
3. Ethylene
4. Kinetins

85 Which PGR is used to initiate flowering and for synchronizing fruit set in pineapple?

1.	Cytokinin	2.	ABA
3.	Ethylene	4.	GA

86 Consider the given two statements:

I:	The most widely used compound as source of ethylene is ethephon.
II:	Ethephon in an aqueous solution is readily absorbed and transported within the plant and releases ethylene slowly.

1. Both **I** and **II** are correct and **II** explains **I**
2. Both **I** and **II** are correct but **II** does not explain **I**
3. **I** is correct but **II** is incorrect
4. **I** is incorrect but **II** is correct

87 Ethylene:

I:	is used to initiate flowering and for synchronising fruit-set in pineapples.
II:	induces flowering in mangoes.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are incorrect
4. Both **I** and **II** are correct

88 Ethephon:

I:	retards fruit ripening in tomatoes and apples.
II:	retards abscission in flowers and fruits in cotton, cherry, walnut.
III:	promotes male flowers in cucumbers thereby decreasing the yield.

1. Only **I** and **II** are correct
2. Only **III** is incorrect
3. Only **I** is correct
4. **I, II** and **III** are incorrect

89 Abscisic acid:

I:	acts as a general plant growth inhibitor and an inhibitor of plant metabolism.
II:	inhibits seed germination.
III:	stimulates the closure of stomata and increases the tolerance of plants to various kinds of stresses.

1. Only **I** and **II** are correct
2. Only **I** and **III** are correct
3. Only **II** and **III** are correct
4. **I, II** and **III** are correct

90 Which PGR stimulates the closure of stomata in the epidermis and increases the tolerance of plants to various kinds of stress?

1.	Cytokinin	2.	Giberrellin
3.	ABA	4.	Ethylene

91 Consider the two statements:

Assertion(A):	ABA is also called the stress hormone.
Reason(R):	ABA plays an important role in seed development, maturation and dormancy.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
3.	**(A)** is True; **(R)** is False.
4.	**(A)** is False; **(R)** is True.

92 In most situations, which PGR acts as an antagonist to GAs?

1.	ABA	2.	Ethylene
3.	Cytokinin	4.	Giberrellin

93 Consider the given two statements:

Statement I:	There are a number of events in the life of a plant where more than one PGR interact to affect that event, e.g., dormancy in seeds/buds, abscission, senescence, apical dominance, etc.
Statement II:	Many of the extrinsic factors such as temperature and light, control plant growth and development via PGR such as vernalisation, flowering, dormancy, seed germination, plant movements, etc.

1. **Statement I** is correct; **Statement II** is incorrect
2. **Statement I** is correct; **Statement II** is correct
3. **Statement I** is incorrect; **Statement II** is correct
4. **Statement I** is incorrect; **Statement II** is incorrect

PLANT GROWTH AND DEVELOPMENT - ANSWER KEY

1.	(2)	2.	(1)	3.	(1)	4.	(2)	5.	(1)	6.	(3)	7.	(3)	8.	(1)	9.	(3)	10.	(4)
11.	(3)	12.	(4)	13.	(1)	14.	(3)	15.	(2)	16.	(2)	17.	(2)	18.	(2)	19.	(1)	20.	(3)
21.	(3)	22.	(3)	23.	(1)	24.	(4)	25.	(3)	26.	(1)	27.	(1)	28.	(2)	29.	(1)	30.	(1)
31.	(2)	32.	(3)	33.	(4)	34.	(4)	35.	(1)	36.	(3)	37.	(4)	38.	(2)	39.	(2)	40.	(2)
41.	(3)	42.	(3)	43.	(1)	44.	(2)	45.	(2)	46.	(1)	47.	(1)	48.	(1)	49.	(3)	50.	(1)
51.	(4)	52.	(1)	53.	(4)	54.	(2)	55.	(1)	56.	(1)	57.	(2)	58.	(1)	59.	(4)	60.	(2)
61.	(3)	62.	(3)	63.	(4)	64.	(1)	65.	(2)	66.	(1)	67.	(1)	68.	(4)	69.	(2)	70.	(2)
71.	(3)	72.	(2)	73.	(2)	74.	(4)	75.	(4)	76.	(4)	77.	(4)	78.	(3)	79.	(4)	80.	(4)
81.	(3)	82.	(3)	83.	(2)	84.	(3)	85.	(3)	86.	(1)	87.	(4)	88.	(4)	89.	(4)	90.	(3)
91.	(2)	92.	(1)	93.	(2)														

BREATHING AND EXCHANGE OF GASES

RESPIRATORY ORGANS

1 Most of the aquatic arthropods respire through:

1. diffusion over entire body surface	2. gills
3. tracheae and tracheoles	4. skin

2 Branchial respiration is seen in all the following except:

1. Aquatic arthropods	2. Fishes
3. Amphibians like frog	4. Aquatic mollusks

3 During summer sleep and winter sleep in frogs, the gaseous exchange takes place:

1. Across the alveoli in the lungs.
2. Through the moist buccal mucosa.
3. In the gills.
4. Through the skin.

4 Name the cavities in which the lungs are located:

1. pleural and abdominal cavities.
2. pericardial and thoracic cavities.
3. pleural and thoracic cavities.
4. pleural and pericardial cavities.

5 During deglutition, the food is prevented from entering into the larynx by the cartilaginous:

1. epiglottis	2. glottis
3. aryepiglottic fold	4. laryngeal prominence

6 The sound box in humans is:

1. the larynx and is entirely made up of cartilage
2. the larynx and is entirely made up of bone
3. the muscular pharynx
4. the glottis where mucosal folds are present

7 Consider the given two statements:

I:	Lower invertebrates like sponges, coelenterates and flatworms exchange oxygen with carbon dioxide by simple diffusion over their entire body surface.
II:	Fishes are the only vertebrates that do not use lungs as respiratory organs.

1.	Only **I** is correct	2.	Only **II** is correct
3.	Both **I** and **II** are correct	4.	Both **I** and **II** are incorrect

8 Identify the incorrect statement regarding respiratory organs:

1.	Lower invertebrates like sponges, coelenterates, flatworms, etc., exchange O_2 with CO_2 by simple diffusion over their entire body surface.
2.	Earthworms use their moist cuticle as respiratory surface.
3.	Insects have a network of tubes (tracheal tubes) to transport atmospheric air within the body.
4.	All vertebrates use lungs as respiratory organs.

9 Trachea is a straight tube extending up to the mid-thoracic cavity, which divides into a right and left primary bronchi at the level corresponding to:

1. Seventh cervical vertebra
2. Second thoracic vertebra
3. Fifth thoracic vertebra
4. Seventh thoracic vertebra

10 The trachea:

I:	divides into two principal bronchi at the level of 7th thoracic vertebra.
II:	is invested by incomplete cartilaginous rings in its wall.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

11 Incomplete cartilaginous rings are seen in the walls of all the following except:

1. Trachea	2. Primary bronchus
3. Tertiary bronchus	4. Respiratory bronchiole

12 What prevents the entry of food into the larynx during deglutition?

1. A thin elastic cartilaginous flap
2. A thick fibrous cartilaginous flap
3. A thick elastic cartilaginous flap
4. A thin calcified cartilaginous flap

13 A minimal amount of pleural fluid present in the pleural cavity:

1. provides a medium for the exchange of respiratory gases
2. reduces friction between the visceral and parietal pleurae
3. provides lubrication for movements of the diaphragm
4. permits the exchange of electrolytes during respiration

14 Consider the given two statements:

Statement I:	The outer pleural membrane is in close contact with the thoracic lining.
Statement II:	The inner pleural membrane is in contact with the lung surface.
Statement III:	The part starting with the external nostrils up to the terminal bronchioles constitutes the respiratory or exchange part of the respiratory system.
Statement IV:	The alveoli and their ducts form the conducting part of the respiratory system.

1. **Statement I** is correct; **Statement II** is correct; **Statement III** is correct; **Statement IV** is correct
2. **Statement I** is incorrect; **Statement II** is incorrect; **Statement III** is incorrect; **Statement IV** is incorrect
3. **Statement I** is correct; **Statement II** is correct; **Statement III** is incorrect; **Statement IV** is incorrect
4. **Statement I** is incorrect; **Statement II** is incorrect; **Statement III** is correct; **Statement IV** is correct

15 The conducting part of the human respiratory system:

I:	clears the air from foreign particles
II:	humidifies the air
III:	brings the air to body temperature.

1. Only **I** and **II** are correct
2. Only **I** and **III** are correct
3. Only **II** and **III** are correct
4. **I, II** and **III** are correct

16 Consider the following two statements:

I:	The lungs are situated in the thoracic chamber which is anatomically an air-tight chamber.
II:	This arrangement is essential as we cannot directly alter the thoracic volume.

1. Both **I** and **II** are correct and **II** correctly explains **I**
2. Both **I** and **II** are correct but **II** does not explain **I**
3. **I** is correct and **II** is incorrect
4. Both **I** and **II** are incorrect

17 Air conditioning – warming, humidifying and filtering of the air, is the function performed by:

1.	oral cavity	2.	nasal cavity
3.	pharynx	4.	larynx

18 Which of the following is not correctly matched?

I:	Thoracic chamber is formed dorsally by	Sternum
II:	Thoracic chamber is formed ventrally by	Vertebral column
III:	Thoracic chamber is formed laterally by	Ribs
IV:	Thoracic chamber is formed on the lower side by	Diaphragm

Options:

1.	**I** and **II** only	2.	**II** only
3.	**III** and **IV** only	4.	**I, II, III** and **IV**

19 Consider the given two statements:

Assertion (A):	The thoracic chamber, being airtight, is critical for breathing.
Reason (R):	Movement of rib cage can bring about inhalation and exhalation.

1. Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2. Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3. **(A)** is True but **(R)** is False.
4. **(A)** is False but **(R)** is True.

20 Consider the following statements:

I:	The thoracic chamber is anatomically an air tight chamber.
II:	Any change in the volume of the thoracic cavity will be reflected in the pulmonary cavity.

1. Both **I** and **II** are correct and **II** explains **I**
2. Both **I** and **II** are correct and **I** explains **II**
3. Both **I** and **II** are correct but **II** does not explain **I**
4. Both **I** and **II** are incorrect

MECHANISM OF BREATHING

21 Consider the given two statements:

Assertion (A):	Inspiration can occur if there is a negative pressure in the lungs with respect to atmospheric pressure.
Reason (R):	The thoracic chamber is an airtight chamber.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**
2.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**
3.	**(A)** is True, **(R)** is False
4.	**(A)** is False, **(R)** is True

22 Consider the given two statements:

Assertion (A):	Relaxation of the diaphragm and the inter-costal muscles brings about inspiration.
Reason (R):	Relaxation of the diaphragm and the inter-costal muscles leads to an increase in intra-pulmonary pressure to slightly above the atmospheric pressure.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**
2.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**
3.	**(A)** is True but **(R)** is False
4.	**(A)** is False but **(R)** is True

23 Inhalation of air into the lungs can be brought about by:

I:	Contraction of diaphragm
II:	Contraction of internal intercostal muscles
III:	Contraction of external intercostal muscles

1. Only **I** and **II**
2. Only **II**
3. Only **I** and **III**
4. Only **III**

24 During inhalation, the diaphragm contracts and flattens. What is the direct consequence of this action on the volume of the thoracic cavity?

1. It decreases
2. It fluctuates
3. It remains unchanged
4. It increases

25 Under normal resting conditions, almost all respiratory effort is due to:

1. contraction and relaxation of diaphragm
2. elevation of rib cage
3. depression of rib cage
4. contraction of abdominal muscles

26 When the diaphragm or external intercostal muscles contract, intrapulmonary pressure should

1.	increase	2.	decrease
3.	remain constant	4.	equal atmospheric pressure

27 Consider the given two statements:

I:	Relaxation of the diaphragm and the intercostal muscles causes the expulsion of air from the lungs.
II:	Relaxation of the diaphragm and the intercostal muscles increases the volume of thoracic chamber in the antero-posterior axis.

1. Both **I** and **II** are correct and **II** explains **I**
2. Both **I** and **II** are correct but **II** does not explain **I**
3. **I** is correct but **II** is incorrect
4. **I** is incorrect but **II** is correct

28 The volume of thoracic chamber in the antero-posterior axis can be increased by:

1. Contraction of diaphragm
2. Relaxation of diaphragm
3. Contraction of external intercostals
4. Contraction of internal intercostals

29 The contraction of external intercostal muscles:

1. elevates the rib cage and brings about exhalation.
2. elevates the rib cage and brings about inhalation.
3. depresses the rib cage and brings about exhalation.
4. depresses the rib cage and brings about inhalation.

30 Consider the given two statements:

Assertion (A):	An increase in pulmonary volume will cause inspiration.
Reason (R):	An increase in pulmonary volume increases the intra-pulmonary pressure to more than the atmospheric pressure.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	**(A)** is False but **(R)** is True.

31 Exhalation of air into the lungs can be brought about by:

I: Contraction of diaphragm

II: Contraction of internal intercostal muscles

III: Contraction of external intercostal muscles

1. Only **I** and **II**
2. Only **II**
3. Only **I** and **III**
4. Only **III**

32 A measure of the amount of air a person inhales during a normal breath is:

1. inspiratory reserve volume	2. vital capacity
3. total lung capacity	4. tidal volume

33 The value of which of the following is normally the highest in normal physiological conditions?

1.	Residual volume	2.	Expiratory reserve volume
3.	Functional residual capacity	4.	Inspiratory reserve volume

34 Under normal physiological conditions, the maximum volume of air a person can breathe out after a forced inspiration in a healthy human being is about:

1.	2300 ml	2.	3500 ml
3.	4600 ml	4.	5800 ml

35 Which of the following equations regarding the calculation of pulmonary capacities would be correct?

1. IC = IRV – TV	2. EC = VC – IRV
3. VC = ERV + IRV	4. TLC = VC – RV

36 The sum of expiratory reserve volume [ERV] and residual volume [RV] corresponds to:

1. Expiratory capacity	2. Vital capacity
3. Functional residual capacity	4. Total lung capacity

37 The amount of air that remains in a person's lungs after fully exhaling is known as:

1. tidal volume	2. expiratory reserve volume
3. vital capacity	4. residual volume

38 The respiratory volume that averages 1100 mL to 1200 mL in a healthy adult male will be:

1. Tidal volume
2. Inspiratory Reserve Volume
3. Expiratory Reserve Volume
4. Residual Volume

39 Which of the following would not be correct regarding vital capacity in human lungs?

1.	It is the maximum volume of air a person can breathe in after a forced expiration.
2.	It includes ERV, TV, RV and IRV
3.	It can also be defined as the maximum volume of air a person can breathe out after a forced inspiration.
4.	It can be calculated as the difference between total lung capacity and residual volume.

40 Which of the following will be considered as 'normal' for a healthy human adult?

I:	A resting respiratory rate of 12- 16 breaths per minute.
II:	A minute ventilation of 6000 – 8000 ml.

1.	Only **I** is correct	2.	Only **II** is correct
3.	Both **I** and **II** are correct	4.	Both **I** and **II** are incorrect

41 On an average, a healthy human breathes:

1. 4-8 times/minute.
2. 8-12 times/minute.
3. 12-16 times/minute.
4. 16-20 times/minute.

42 Consider the two statements:

Statement I:	Expiratory Capacity is the total volume of air a person can expire after a normal inspiration.
Statement II:	Functional Residual Capacity is the volume of air that will remain in the lungs after a forceful maximal expiration.

1. **Statement I** is correct; **Statement II** is correct
2. **Statement I** is correct; **Statement II** is incorrect
3. **Statement I** is incorrect; **Statement II** is correct
4. **Statement I** is incorrect; **Statement II** is incorrect

43 Vital capacity can be defined as:

I:	The maximum volume of air a person can breathe in after a normal expiration.
II:	The maximum volume of air a person can breathe out after a normal inspiration.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

44 Regarding pulmonary volumes and capacities, which of the following will not hold true?

1. TLC – VC = RV
2. TLC – RV = FRC
3. IC = VC - ERV
4. ERV + RV = FRC

45 Functional residual capacity is defined as:

1.	Total volume of air a person can inspire after a normal expiration.
2.	Volume of air that will remain in the lungs after a normal expiration.
3.	Total volume of air a person can expire after a normal inspiration.
4.	The maximum volume of air a person can breathe in after a forced expiration

46 Consider the two statements:

Statement I:	The vital capacity (VC) of the lungs is equal to the sum of the tidal volume (TV), the inspiratory reserve volume (IRV), and the expiratory reserve volume (ERV).
Statement II:	Mathematically, FRC can be represented as: FRC = RV + ERV

1.	**Statement I** is correct; **Statement II** is correct
2.	**Statement I** is correct; **Statement II** is incorrect
3.	**Statement I** is incorrect; **Statement II** is correct
4.	**Statement I** is incorrect; **Statement II** is incorrect

47 Which of the following correctly describes one of the pulmonary volumes?

1.	Tidal Volume (TV) is the total volume of air that can be exhaled after normal inhalation.
2.	Residual Volume (RV) is the amount of air left in the lungs after a forceful exhalation.
3.	Inspiratory Reserve Volume (IRV) is the volume of air inhaled during a normal breath.
4.	Expiratory Reserve Volume (ERV) is the maximum volume of air that can be inhaled after a normal exhalation.

48 The pulmonary function of a person reveals the following values:

a. tidal volume = 500 mL

b. residual volume = 1000 mL

c. inspiratory reserve volume = 2500 mL

d. expiratory reserve volume = 1000 mL

His vital capacity is

1. 3000 mL	2. 3500 mL
3. 4000 mL	4. 5000 mL

49 Match the items given Column I with those in Column II and select the correct option given below:

	Column I		Column II
a.	Tidal volume	(i)	2500-3000 mL
b.	Inspiratory Reserve	(ii)	1100-1200 mL
c.	Expiratory Reserve	(iii)	500-550 mL
d.	Residual volume	(iv)	1000-1100 mL

Options:

	a	b	c	d
1.	iii	ii	i	iv
2.	iii	i	iv	ii
3.	i	iv	ii	iii
4.	iv	iii	ii	i

50 Which of the following pulmonary capacities is not correctly matched with its constituent pulmonary volumes?

1.	Inspiratory capacity	Tidal volume + Inspiratory reserve volume
2.	Expiratory capacity	Tidal volume + Expiratory reserve volume
3.	Functional residual capacity	Residual volume + Inspiratory reserve volume
4.	Vital capacity	Tidal volume + Inspiratory reserve volume + Expiratory reserve volume

EXCHANGE OF GASES

51 Transport of gases in alveoli takes place by:

1. Active transport	2. Passive transport
3. Simple diffusion	4. None of the above

52 Exchange of gases occurs across the respiratory membrane. Which of the following would increase the rate of diffusion of a gas across the respiratory membrane?

1.	respiratory membrane becomes thicker.
2.	surface area of the respiratory membrane decreases.
3.	partial pressure difference of the gas across the respiratory membrane increases.
4.	diffusion coefficient of the gas decreases.

53 With respect to the atmospheric air, the deoxygenated blood flowing into lung capillaries has a higher concentration of:

1. oxygen	2. both carbon dioxide and oxygen
3. carbon monoxide	4. carbon dioxide

54 What is the partial pressure of oxygen and carbon dioxide respectively in the venous blood leaving the tissues [in mm of Hg]?

1. 104, 40	2. 95, 40
3. 40, 45	4. 20, 46

55 The partial pressure of oxygen in oxygenated blood is about:

1. 104 mmHg	2. 100 mmHg
3. 95 mmHg	4. 40 mmHg

56 Which of the following will not be equal in normal physiological conditions?

1.	Partial pressure of oxygen in deoxygenated blood and partial pressure of oxygen in tissues
2.	Partial pressure of carbon dioxide in alveoli and partial pressure of carbon dioxide in oxygenated blood
3.	Partial pressure of oxygen in oxygenated blood and partial pressure of oxygen in alveoli
4.	Partial pressure of carbon dioxide in tissues and partial pressure of carbon dioxide in deoxygenated blood

57 The value of partial pressure of oxygen in alveolar air is:

1. less than that in oxygenated blood
2. more than that in atmospheric air
3. equal to that in oxygenated blood
4. more than that in tissues

58 Consider the given two statements:

Statement I:	pO_2 in alveolar air is less than the pO_2 in atmospheric air.
Statement II:	pCO_2 in alveolar air is less than the pCO_2 in atmospheric air.

1. **Statement I** is correct; **Statement II** is correct
2. **Statement I** is incorrect; **Statement II** is correct
3. **Statement I** is correct; **Statement II** is incorrect
4. **Statement I** is incorrect; **Statement II** is incorrect

59 O_2 and CO_2 are exchanged by simple diffusion mainly based on pressure/concentration gradient at:

I: Alveoli
II: Tissues

1. Only I
2. Only II
3. Both I and II
4. Neither I nor II

60 Where do you expect the partial pressure of oxygen to be the highest?

1. in the alveolar air
2. in the deoxygenated blood
3. in the oxygenated blood
4. at tissues

61 The partial pressure of CO_2 in deoxygenated blood and tissues is about:

1. 40 mm Hg
2. 45 mm Hg
3. 100 mm Hg
4. 104 mm Hg

62 What is the partial pressure of carbon dioxide in the alveoli of human lungs?

1. 40 mm Hg
2. 45 mm Hg
3. 95 mm Hg
4. 104 mm Hg

63 Match Column I with values given in Column II:

	Column I Partial Pressure of		Column II Value (in mm of Hg)
A.	Carbon dioxide in tissues	1.	104
B.	Carbon dioxide in alveoli	2.	40
C.	Oxygen in alveoli	3.	45
D.	Oxygen in oxygenated blood	4.	95

1. A-1, B-2, C-4, D-3
2. A-3, B-1, C-2, D-4
3. A-3, B-2, C-1, D-4
4. A-2, B-1, C-3, D-4

64 When compared with carbon dioxide, the partial pressure of oxygen in the air and its solubility in water is respectively:

1. lower, lower	2. lower, higher
3. greater, lower	4. greater, higher

65 The correct sequence of the magnitude of the partial pressure of oxygen [beginning at the maximum] will be:

1.	Atmospheric air → Oxygenated blood → Alveoli → Tissues
2.	Alveoli → Atmospheric air → Oxygenated blood → Tissues
3.	Atmospheric air → Alveoli → Oxygenated blood → Tissues
4.	Alveoli → Atmospheric air → Oxygenated blood → Deoxygenated blood

66 Consider the two statements:

Assertion (A):	Carbon dioxide (CO_2) diffuses faster than oxygen (O_2) across the respiratory membrane.
Reason (R):	CO_2 is 20–25 times more soluble in blood and alveolar fluids than O_2.

1.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
2.	**(A)** is True but **(R)** is False.
3.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
4.	**(A)** is False but **(R)** is True.

67 Consider the given two statements:

Assertion (A):	O_2 has a greater diffusing capacity than CO_2 across the respiratory diffusion membrane.
Reason (R):	O_2 is more soluble in water than CO_2.

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**
3.	**(A)** is True but **(R)** is False
4.	**Both (A)** and **(R)** are False

68 In the diffusion membrane in human lungs, a basement membrane supports:

I. Alveolar epithelium	II. Vascular endothelium

1.	Only I	2.	Only II
3.	Both I and II	4.	Neither I nor II

69 Which of the following layers are found in the respiratory diffusion membrane?

1.	Capillary endothelium, alveolar epithelium, and basement membrane
2.	Alveolar epithelium, alveolar macrophages, and capillary endothelium
3.	Mucous layer, alveolar epithelium, and capillary endothelium
4.	Basement membrane, mucous layer, and alveolar macrophages

70 Consider the two statements:

Statement I:	The respiratory membrane has one layer - the simple squamous epithelium of the alveoli.
Statement II:	Oxygen diffuses faster from carbon dioxide across the respiratory membrane.

1. **Statement I** is correct: **Statement II** is incorrect
2. **Statement I** is incorrect: **Statement II** is correct
3. **Statement I** is correct: **Statement II** is correct
4. **Statement I** is incorrect: **Statement II** is incorrect

71 The cumulative thickness of the three layers of the diffusion [respiratory] membrane is:

1. less than 1 μm
2. less than 1mm
3. between 2 μm and 5 μm
4. between 2 mm and 5 mm

72 How would the diffusing capacities of carbon dioxide and oxygen across the respiratory membrane compare?

1.	The diffusing capacity of oxygen is 20 to 25 times higher than the diffusing capacity of carbon dioxide.
2.	The diffusing capacity of carbon dioxide is 20 to 25 times higher than the diffusing capacity of oxygen.
3.	The diffusing capacity of oxygen is 200 to 250 times higher than the diffusing capacity of carbon dioxide.
4.	The diffusing capacity of carbon dioxide is 200 to 250 times higher than the diffusing capacity of oxygen.

TRANSPORT OF GASES

73 What is true about RBCs in humans?

1.	They carry about 20-25 percent of CO_2
2.	They transport 99.5 percent of O_2
3.	They transport about 80 percent oxygen only and the rest 20 percent of it is transported in a dissolved state in blood plasma
4.	They do not carry CO_2 at all

74 Carbon dioxide is transported in blood by all the following mechanisms except:

1. bound to the protein portion of hemoglobin
2. bound to the iron atoms of hemoglobin
3. dissolved in plasma
4. as bicarbonate

75 The major mode of transport of carbon dioxide in human body is:

1.	in combination with hemoglobin
2.	in dissolved state in plasma
3.	as carboxyhemoglobin
4.	as bicarbonate

76 Consider the given two statements:

Statement I:	Each haemoglobin molecule can carry a maximum of four molecules of O_2.
Statement II:	Hemoglobin can bind to four molecules of CO_2.

1. **Statement I** is correct; **Statement II** is correct
2. **Statement I** is correct; **Statement II** is incorrect
3. **Statement I** is incorrect; **Statement II** is correct
4. **Statement I** is incorrect; **Statement II** is incorrect

77 Hemoglobin carrying carbon dioxide is called as:

1. Deoxyhemoglobin	2. Carbaminohemoglobin
3. Carboxyhemoglobin	4. Oxyhemoglobin

78 The binding of oxygen with hemoglobin is primarily related to:

1.	Partial pressure of carbon dioxide
2.	Partial pressure of oxygen
3.	H^+ ion concentration in body fluids
4.	Presence of 2,3-DPG in erythrocytes

79 The shape of the oxygen dissociation curve is:

1. a rectangular hyperbola
2. sigmoid
3. ellipse
4. parabola

80 Regarding haemoglobin and oxygen binding:

I:	Oxygen binds with haemoglobin in an irreversible manner to form oxyhaemoglobin.
II:	Each haemoglobin molecule can carry a maximum of four molecules of O_2.
III:	The binding of oxygen with haemoglobin is primarily related to the partial pressure of O_2.

1. Only **I** and **II** are correct
2. Only **I** and **III** are correct
3. Only **II** and **III** are correct
4. **I, II** and **III** are correct

81 Oxygen binding to haemoglobin in blood is

1.	directly proportional to the concentration of CO_2 in the medium
2.	inversely proportional to the concentration of CO_2 in the medium
3.	directly proportional to the concentration of CO in the medium
4.	independent of the concentration of CO in the medium

82 The oxy-hemoglobin dissociation curve shifts to the right in all the following conditions except:

1. Presence of 2,3-DPG	2. Increased temperature
3. Increased pH	4. Increased carbon dioxide

83 What does a right shift in the oxygen dissociation curve of hemoglobin indicate about the physiological conditions?

1.	Decreased oxygen affinity, indicating conditions such as a lower pH, a higher temperature, or increased levels of CO_2.
2.	Increased oxygen affinity, indicating conditions such as a higher pH, a lower temperature, or decreased levels of CO_2.
3.	Decreased temperature and CO_2 levels, leading to a reduced ability of hemoglobin to release oxygen to tissues.
4.	Increased hemoglobin saturation with oxygen at lower partial pressures, indicating hyperventilation.

84 The formation of oxy-hemoglobin at the alveoli is favored by all the following except:

1. High pO_2	2. Low pCO_2
3. Lower H^+ ion concentration	4. Higher temperature

85 Why would hemoglobin deliver oxygen to the tissues?

1. oxygen concentration of tissue fluid is lower
2. carbon dioxide concentration of tissue fluid is lower
3. carbon dioxide concentration of tissue fluid is higher
4. the oxygen concentration of blood is lower

86 Identify the wrong statement with reference to the transport of oxygen.

1.	Partial pressure of CO_2 can interfere with O_2 binding with haemoglobin.
2.	Higher H^+ conc. in alveoli favours the formation of oxyhaemoglobin.
3.	Low pCO_2 in alveoli favours the formation of oxyhaemoglobin.
4.	Binding of oxygen with haemoglobin is mainly related to partial pressure of O_2.

87 Under normal physiological conditions, every 100 ml of oxygenated blood can deliver around:

1. 4 ml of O_2 to the tissues.
2. 5 ml of O_2 to the tissues.
3. 4 ml of O_2 to the alveoli.
4. 5 ml of O_2 to the alveoli.

88 CO_2 is carried by haemoglobin as:

1. carbamino-haemoglobin
2. carboxy-haemoglobin
3. deoxy-haemoglobin
4. oxidised haemoglobin

89 Transport as carbaminohaemoglobin accounts for what percent of total carbon dioxide transport in blood?

1. 5 to 7
2. 20 to 25
3. 50 to 55
4. 70

90 The formation of carbaminohaemoglobin at tissue is primarily related to:

1.	pCO_2	2.	pO_2
3.	H^+ ions	4.	Temperature

91 The binding of carbon dioxide to hemoglobin:

I: is related to the partial pressure of carbon dioxide
II: is affected by the partial pressure of oxygen

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

92 Identify the incorrect statement regarding carbonic anhydrase:

1.	RBCs contain a very high concentration of the enzyme.
2.	It is not present at all in the plasma.
3.	It assists rapid inter-conversion of carbon dioxide and water into carbonic acid, protons and bicarbonate ions.
4.	The active site of the enzyme contains a zinc ion.

93 What amount of carbon dioxide is delivered by every 100 ml of deoxygenated blood at the alveoli under normal physiological conditions?

1. 4 ml	2. 5 ml
3. 15 ml	4. 20 ml

94 Consider the two statements regarding transport of carbon dioxide as bicarbonate:

Statement I:	At the alveolar site where partial pressure of CO_2 is high due to catabolism, CO_2 diffuses into blood (RBCs and plasma) and forms HCO_3^- and H^+.
Statement II:	At the tissue site where pCO_2 is low, the reaction proceeds in the opposite direction leading to the formation of CO_2 and H_2O.

1. **Statement I** is correct; **Statement II** is correct
2. **Statement I** is correct; **Statement II** is incorrect
3. **Statement I** is incorrect; **Statement II** is correct
4. **Statement I** is incorrect; **Statement II** is incorrect

95 At about what partial pressure of oxygen (in mm of Hg) is the percent saturation of hemoglobin with oxygen 50% (give approximate value)?

1. 27
2. 40
3. 75
4. 100

96 Amongst the following, which gas has the highest affinity for haemoglobin?

1. CO_2
2. N_2
3. O_2
4. CO

97 Hemoglobin's oxygen binding affinity is inversely related both to acidity and to the concentration of carbon dioxide. This is:

1. Haldane effect
2. Bohr effect
3. Herring Breuer reflex
4. Henry's law

98 The ability of hemoglobin to carry increased amounts of carbon dioxide (CO_2) in the deoxygenated state as opposed to the oxygenated state is explained by:

1. Haldane effect
2. Bohr effect
3. Herring Breuer reflex
4. Henry's law

REGULATION OF RESPIRATION

99 The part of the human brain where the main respiratory center is located is:

1.	pons varolii	2.	cerebrum
3.	medulla oblongata	4.	thalamus

100 Regarding neural regulation of respiration in humans:

I:	The respiratory rhythm is present in the medulla region of the brain.
II:	Pneumotaxic centre present in cerebrum can moderate the functions of the respiratory rhythm centre.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

101 The respiratory rhythm center:

I:	is located in the medulla oblongata.
II:	regulates the duration of inhalation and increases respiratory rate.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

102 The duration of inspiration can be reduced by:

1.	an increase of carbon dioxide in blood
2.	a chemical signal from aortic and carotid bodies
3.	a neural signal from pneumotaxic center
4.	an increase in hydrogen ion concentration in CSF

103 Pneumotaxic center:

1.	moderates the function of the rhythm center
2.	establishes the respiratory rhythm
3.	is located in medulla oblongata
4.	reduces the duration of expiration and thereby alters the respiratory rate

104 A chemosensitive area is situated adjacent to the rhythm centre which is highly sensitive to:

I: CO_2
II: O_2
III: hydrogen ions

1. Only I and II
2. Only I and III
3. Only II and III
4. I, II and III

105 Peripheral chemoreceptors for regulation of respiration are located:

1. In the aorta and the carotid artery
2. In the medulla oblongata
3. In the pons
4. In the alveoli

106 The respiratory center in humans can be primarily stimulated by:

1. carbon dioxide and hydrogen ions
2. oxygen gas levels in the blood
3. oxygen gas levels in the hemoglobin
4. conscious feeling for the need for more oxygen

107 Consider the two statements:

Statement I:	Peripheral chemoreceptors can recognise changes in CO_2 and H^+ concentration
Statement II:	The role of oxygen in the regulation of respiratory rhythm is quite insignificant

1.	**Statement I** is correct and **Statement II** is incorrect
2.	**Statement I** is incorrect and **Statement II** is correct
3.	Both **Statement I** and **Statement II** are correct
4.	Both **Statement I** and **Statement II** are incorrect

DISORDERS OF RESPIRATORY SYSTEM

108 A condition in which a person's airways become inflamed, narrow, swell and produce extra mucus, which makes it difficult to breathe is known as

1.	Asthma
2.	Emphysema
3.	Chronic bronchitis
4.	Chronic obstructive pulmonary disease

109 Which of the following is incorrect regarding emphysema?

1.	Alveolar walls are damaged
2.	There is an increase in the respiratory surface
3.	Major cause is cigarette smoking
4.	Can be caused by deficiency of Alpha-1-antitrypsin enzyme

110 Identify the correctly matched pairs:

I.	Asthma	inflammation of bronchi and bronchioles
II.	Emphysema	alveolar walls are damaged due to which respiratory surface is decreased
III.	Occupational Respiratory Disorders	fibrosis [proliferation of fibrous tissues]

1. I and II only
2. I and III only
3. II and III only
4. I, II and III

111 The pathological hallmark of Bronchial Asthma is:

1. Pulmonary fibrosis
2. Pleural edema
3. Breaking of alveolar septa
4. Inflammation of bronchi and bronchioles

112 A difficulty in breathing causing wheezing due to inflammation of bronchi and bronchioles characterises:

1. Emphysema
2. Asthma
3. Tuberculosis
4. Common cold

113 Emphysema and asthma both affect the lungs but differ in that:

1.	Asthma is characterized by excessive mucus production while emphysema involves the destruction of alveoli.
2.	Emphysema is an acute response to allergens, whereas asthma is a chronic condition.
3.	Asthma can be cured by medication, while emphysema is irreversible.
4.	Emphysema results from allergic reactions, while asthma results from long-term exposure to pollutants.

114 Occupational Respiratory Disorders:

I:	are caused by long exposure to dust at work place.
II:	can give rise to inflammation leading to fibrosis (proliferation of fibrous tissues) and thus causing serious lung damage.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

BREATHING AND EXCHANGE OF GASES - ANSWER KEY

1.	(2)	2.	(3)	3.	(4)	4.	(3)	5.	(1)	6.	(1)	7.	(3)	8.	(4)	9.	(3)	10.	(2)
11.	(4)	12.	(1)	13.	(2)	14.	(3)	15.	(4)	16.	(3)	17.	(2)	18.	(1)	19.	(2)	20.	(2)
21.	(2)	22.	(4)	23.	(3)	24.	(4)	25.	(1)	26.	(2)	27.	(3)	28.	(1)	29.	(2)	30.	(3)
31.	(2)	32.	(4)	33.	(4)	34.	(3)	35.	(2)	36.	(3)	37.	(4)	38.	(4)	39.	(2)	40.	(3)
41.	(3)	42.	(2)	43.	(4)	44.	(2)	45.	(2)	46.	(1)	47.	(2)	48.	(3)	49.	(2)	50.	(3)
51.	(3)	52.	(3)	53.	(4)	54.	(3)	55.	(3)	56.	(3)	57.	(4)	58.	(3)	59.	(3)	60.	(1)
61.	(2)	62.	(1)	63.	(3)	64.	(3)	65.	(3)	66.	(3)	67.	(4)	68.	(3)	69.	(1)	70.	(4)
71.	(2)	72.	(2)	73.	(1)	74.	(2)	75.	(4)	76.	(1)	77.	(2)	78.	(2)	79.	(2)	80.	(3)
81.	(2)	82.	(3)	83.	(1)	84.	(4)	85.	(1)	86.	(2)	87.	(2)	88.	(1)	89.	(2)	90.	(1)
91.	(3)	92.	(2)	93.	(1)	94.	(4)	95.	(1)	96.	(4)	97.	(2)	98.	(1)	99.	(3)	100.	(1)
101.	(1)	102.	(3)	103.	(1)	104.	(2)	105.	(1)	106.	(1)	107.	(3)	108.	(1)	109.	(2)	110.	(4)
111.	(4)	112.	(2)	113.	(1)	114.	(3)												

THE BLOOD

1 In 100 mL of blood, what is the expected volume of plasma?

1.	90 mL	2.	10 mL
3.	45 mL	4.	55 mL

2 What is the percentage of proteins in plasma?

1.	10%	2.	7%
3.	25%	4.	92%

3 Identify the incorrectly matched pair:

1.	Plasma protein	–	6 to 8 %
2.	Formed elements	–	55% of the blood
3.	Hemoglobin	–	12 to 16 gm in 100 ml of blood
4.	Platelets	–	150000 to 350000 mm^{-3}

4 The colloid osmotic pressure in the human blood is largely due to:

1.	electrolytes	2.	albumin
3.	fibrinogen	4.	globulins

5 Identify the correct statements:

I:	Fibrinogens are needed for clotting or coagulation of blood.
II:	Globulins, primarily, are involved in the defense mechanisms of the body.
III:	The albumins help in osmotic balance.

1.	Only **I**	2.	Only **I** and **III**
3.	Only **II** and **III**	4.	**I, II** and **III**

6 Formed elements and clotting factors are removed from the blood. The remaining fluid will be called as:

1.	Plasma	2.	Lymph
3.	Serum	4.	Antiserum

7 A person has a complete blood count done. Which of the following would not be normal?

1. total RBC count - 5.0 million /µL
2. total WBC count – 1500 /µL
3. total platelet count - 225,000 /µL
4. hemoglobin – 14.5 g / 100 ml

8 Erythrocytes, or RBCs:

I:	lack both a nucleus and mitochondria organelles.
II:	are much more common than leukocytes in the blood.
III:	require dietary iron and vitamin B12 for normal production.
IV:	have a circulating life span of about twelve months.

1. Only **I, II** and **III** are correct
2. Only **I, III** and **IV** are correct
3. Only **II, III** and **IV** are correct
4. **I, II, III** and **IV** are correct

9 Consider the following statements about human blood:

I:	Red blood cells in humans have a nucleus.
II:	Blood plasma contains fibrinogen which helps in clotting.

1. Only **Statement I** is correct.
2. Only **Statement II** is correct.
3. Both **Statements** are correct.
4. Neither **Statement** is correct.

10 Match the following blood components with their functions:

	Component (List I)		**Function (List II)**
A.	Plasma	1.	Transport of oxygen and carbon dioxide
B.	Red Blood Cells (RBCs)	2.	Clot formation
C.	White Blood Cells (WBCs)	3.	Regulation of blood volume and pressure
D.	Platelets	4.	Defense against pathogens

1. A-1, B-2, C-4, D-3
2. A-3, B-1, C-4, D-2
3. A-3, B-1, C-2, D-4
4. A-2, B-4, C-1, D-3

11 Erythrocytes in humans are destroyed mainly in:

1.	liver and spleen	2.	heart and lungs
3.	bone marrow	4.	kidney

12 The average life span of human red blood cells is:

1.	10 days	2.	120 days
3.	21 days	4.	three months

13 The least common of WBCs in the human blood are:

1.	Eosinophils	2.	Lymphocytes
3.	Neutrophils	4.	Basophils

14 Which of the following white blood cells is not correctly matched to its abundance out of the total white blood cells in a healthy human being?

1.	Neutrophils	60 – 65 %
2.	Eosinophils	2 – 3 %
3.	Monocytes	6 – 8 %
4.	Basophils	20 – 25 %

15 When compared to the adult red blood cells in human blood, the adult white blood cells are:

I: lesser in number
II: longer lived
III: nucleated

1. Only **I** and **II** are correct
2. Only **I** and **III** are correct
3. Only **II** and **III** are correct
4. **I, II** and **III** are correct

16 The most frequent and the least frequent white blood cells in the blood of a healthy adult human will, respectively, be:

1. Neutrophil and Eosinophil
2. Lymphocyte and Basophil
3. Neutrophil and Basophil
4. Lymphocyte and Monocyte

17 Heparin:

1.	is an anti-coagulant secreted by the basophils in the blood
2.	is an anti-coagulant secreted by the eosinophils in the blood
3.	is a thrombolytic secreted by the basophils in the blood
4.	is a thrombolytic secreted by the eosinophils in the blood

18 How many of the given statements regarding leucocytes in human are true?

I.	Neutrophils are the most abundant cells (60-65 percent) of the total WBCs.
II:	Basophils are the least (0.5-1 percent) of the total WBCs.
III:	Neutrophils and monocytes (6-8 percent) are phagocytic cells.
IV:	Basophils secrete histamine, serotonin, heparin, etc., and are involved in inflammatory reactions.
V:	Eosinophils (2-3 percent) resist infections and are also associated with allergic reactions.
VI:	Lymphocytes (20-25 percent) are responsible for immune responses of the body.

1.	3	2.	4
3.	5	4.	6

19 Granulocytes are white blood cells that include:

I:	Basophil
II:	Eosinophil
III:	Lymphocyte
IV:	Monocyte

1. Only **I** and **II**
2. Only **III** and **IV**
3. Only **I** and **III**
4. Only **II** and **IV**

20 The two main phagocytes in the human blood include neutrophils and:

1.	Lymphocytes	2.	Basophils
3.	Monocytes	4.	Eosinophils

21 Regarding leucocytes:

I:	They are nucleated.
II:	Neutrophils, eosinophils and basophils are different types of granulocytes.
III:	Lymphocytes and monocytes are the agranulocytes.

1. Only **I** and **II** are correct
2. Only **I** and **III** are correct
3. Only **II** and **III** are correct
4. **I, II** and **III** are correct

22

Assertion(A):	A decrease in lymphocyte count in the blood will lead to an increased susceptibility to infections.
Reason(R):	Lymphocytes are responsible for phagocytosis in innate immune response.

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	**(A)** is False but **(R)** is True.

23 Histamine, the mediator in inflammatory reactions, is released in the blood by:

1.	Basophils	2.	Neutrophils
3.	Eosinophils	4.	Lymphocytes

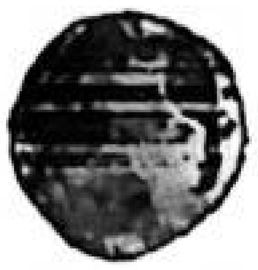
24 Which WBC has a large kidney-shaped nucleus, does not have granules in the cytoplasm, and after differentiation performs phagocytosis?

1. Neutrophil
2. Basophil
3. Lymphocyte
4. Monocyte

25 Comprising about 2-3% of the total white blood cells, which of the following resist infections and are also associated with allergic reactions?

1.	Eosinophils	2.	Basophils
3.	Monocytes	4.	Lymphocytes

26 The cell shown in the given diagram:



1.	is a bone marrow stem cells committed to produce RBCs
2.	is the megakaryocyte
3.	is the commonest WBC and is phagocytic
4.	is responsible for acquired immunity in humans

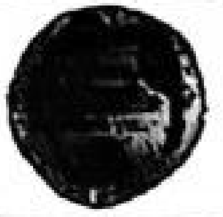
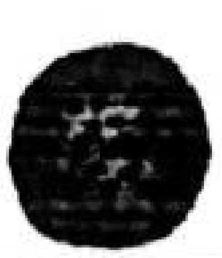
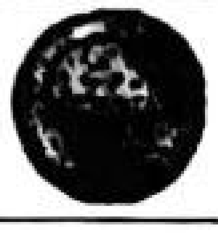
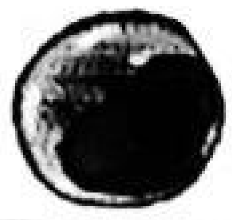
27 Match blood cells given in Column I with their most important function in Column II and select the correct match from the codes given:

	Column I		**Column II**
A.	Neutrophils	P.	Phagocytosis
B.	Basophils	Q.	Inflammatory reactions
C.	Lymphocytes	R.	Immune responses
D.	Thrombocytes	S.	Coagulation of blood

Codes:

	A	B	C	D
1.	P	Q	R	S
2.	Q	P	S	R
3.	R	S	P	Q
4.	S	R	Q	P

28 Select the option having all the correct characteristics:

	Structure	**Percentage**	**Function**
1.		0.3-0.5	Phagocytic
2.		0.5-1.0	Secrete histamine
3.		30-40	Defense against parasites
4.		30-40	Allergic reactions

29 Platelets are cell fragments that:

I:	are produced from megakaryocytes in the spleen in fetal life
II:	can release variety of factors involved in blood coagulation

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

30 The second most common formed elements in the human blood are:

1.	Proteins	2.	Water
3.	RBC	4.	Thrombocytes

31 A person does not have megakaryocytes. This person:

1.	will not be able to make white blood cells
2.	will not be able to make red blood cells
3.	will have a reduced ability to prevent blood loss
4.	will not be able to defend against bacteria

32 The clotting of blood is an important function attributed in human blood to:
1. Erythrocytes
2. Leukocytes
3. Thrombocytes
4. Neutrophils

33 When anti B antibodies are present in the plasma and A antigens on the surface of RBCs of a person, her blood group can be:

1.	A and AB	2.	Only A
3.	Only B	4.	O

34 A person has type A antigen on RBC and anti-B antibodies in plasma. He can receive blood from a person with blood group:

1.	A and O	2.	AB, A, B and O
3.	B and O	4.	Only O

35 Which of these statements about the ABO blood group is NOT true?

1.	A person with type O blood can donate blood to individuals with type A, B, AB, or O blood types.
2.	Transfusions should be made considering the plasma of the donor and the erythrocytes of the patient (recipient).
3.	A person with type A blood should not receive a transfusion from someone with type AB blood.
4.	A person with type O blood has both the A and B antigens.

36 What is true for the blood Type O?

1.	It is universal donor because it has neither anti-A antibodies nor anti-B antibodies circulating in the plasma.
2.	It is universal donor because it has neither antigen A nor antigen B on its RBCs.
3.	It is universal recipient because it has neither anti-A antibodies nor anti-B antibodies circulating in the plasma.
4.	It is universal recipient because it has neither antigen A nor antigen B on its RBCs.

37 Consider the given two statements:

Statement I:	ABO grouping is based on the presence or absence of three surface antigens on the RBCs namely A, B and O.
Statement II:	Rh grouping is based on the presence or absence of the type of antibody present in the plasma.

1.	**Statement I** is correct; **Statement II** is correct
2.	**Statement I** is incorrect; **Statement II** is incorrect
3.	**Statement I** is incorrect; **Statement II** is correct
4.	**Statement I** is correct; **Statement II** is incorrect

38 What is the type of antibody found in the plasma of a person whose RBCs have type B antigen on the surface?
1. anti-A
2. anti-B
3. both anti-A and anti-B
4. neither anti-A nor anti-B

39 Consider the two statements:

Statement I:	People who are blood type O have both anti-A and anti-B antibodies present in their plasma.
Statement II:	People who are blood type AB do not produce either anti-A or anti-B antibodies.

1. **Statement I** is correct: **Statement II** is incorrect
2. **Statement I** is incorrect: **Statement II** is correct
3. **Statement I** is correct: **Statement II** is correct
4. **Statement I** is incorrect: **Statement II** is incorrect

40 In the ABO blood group system, the blood type AB means:

1.	Anti-A and anti-B antibodies are present in the plasma
2.	The absence of A and B antigens on the red cells
3.	The presence of both A and B antigens on the red cells
4.	The presence of anti-A and anti-B antigens on the red cells

41 Consider the given two statements:

Assertion(A):	Individuals with type AB blood are universal recipients for blood transfusions.
Reason(R):	They possess neither A nor B antigens on their red blood cells.

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	**(A)** is False but **(R)** is True.

42 An Rh –ve person, when exposed to Rh +ve blood:

1.	will form antibodies against the Rh antigen
2.	will be unaffected
3.	will form antibodies against the Rh antigen only on second exposure
4.	will receive anti Rh antibodies from the donor

43 To prevent eryhtroblastosis fetalis in future pregnancies:

1.	Anti-Rh Immunoglobulins must be given to Rh –ve mothers at the time of each delivery
2.	Anti-Rh Immunoglobulins must be given to new born at the time of each delivery
3.	Rh Antigens must be given to new born at the time of each delivery
4.	Anti Antigens must be given to Rh –ve mothers at the time of each delivery

44 Identify the incorrect statement regarding the hemolytic disease of the newborn:

1.	The fetus is Rh positive, and the mother is Rh negative.
2.	The mother's immune system has made antibodies against the Rh factor present on the red blood cells of the previous baby.
3.	The baby is born with an abnormally high number of red blood cells.
4.	This can be prevented if the Rh negative mother has been given RhoGAM (antibodies).

45 Regarding erythroblastosis fetalis:

I:	The baby is Rh positive and the mother is Rh negative.
II:	The mother's immune system has made antibodies against the Rh factor present on the red blood cells of the previous baby.
III:	Anaemia and jaundice in a baby are rare.
IV:	There is no mechanism to prevent its occurrence.

1. **I, II, III** and **IV** are correct
2. Only **I** and **II** are correct
3. Only **III** and **IV** are correct
4. Only **I** is correct

46 Consider the given two statements:

Assertion (A):	Erythroblastosis fetalis occurs when an Rh-negative mother carries an Rh-positive fetus.
Reason (R):	The mother's immune system may produce antibodies against the Rh factor, which can cross the placenta and attack the fetal red blood cells.

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	Both **(A)** and **(R)** are False.

47 An Rh + woman is pregnant with an Rh- fetus. The consequences can be:

1.	There is usually no risk during the first pregnancy, but it can harm the fetus during a subsequent pregnancy if the mother is not treated.
2.	It always poses a serious risk to the fetus, even in the first pregnancy.
3.	Only in rare cases is there a risk to the fetus during the first pregnancy.
4.	There is no risk to the fetus when a woman who is Rh+ carries an Rh- fetus.

48 The enzyme that activates fibrinogens in the blood is:

1.	Thromboplastin	2.	Thrombokinase
3.	Thrombin	4.	Plasmin

49 Which of the following can be called as a 'cascade' process?

1.	Micturition reflex
2.	Formation of cross bridges in skeletal muscle contraction
3.	Coagulation of blood
4.	Regulation of respiration

50 Which of the following ions is vital for coagulation of blood?

1.	Na^+	2.	Ca^{++}
3.	K^+	4.	H^+

51 To activate coagulation at the site of injury, certain factors that play an important role in coagulation, can be released by:

1.	Platelets and damaged tissue
2.	Basophils and mast cells
3.	Wall of the damaged vessel and basophils
4.	Platelets and mast cells

LYMPH

52 Another name for lymph would be:

1.	Extra-cellular fluid	2.	Tissue fluid
3.	Plasma ultrafiltrate	4.	Serous fluid

53 The interstitial fluid or tissue fluid:

I:	is released out as the blood passes through the capillaries in tissues leaving the larger proteins and most of the formed elements in the blood vessels.
II:	has nearly the same mineral distribution as that in plasma.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

54 Lymph does not contain:

1.	proteins	2.	microorganisms
3.	red blood cells and platelets	4.	minerals

55 Exchange of nutrients and gases between the blood and the cells always occurs:

1. by active transport
2. with the help of transport carrier proteins
3. at the arterial end of the capillary network
4. through the interstitial fluid

56 The functions of the lymphatic system do not include:

1.	The removal of interstitial fluid from tissues
2.	Transport of factors needed for coagulation of blood
3.	transport of nutrients and hormones
4.	Absorption and transport of end products of fat digestion

57 What is true regarding the lymphatic system?

1.	A two-way transport system with fluids and cells moving in both directions
2.	A continuous closed circulation running parallel to the arteries and veins
3.	A one-way system collecting the lymph from body tissues and spaces and reintroducing it to the bloodstream
4.	A one-way system collecting lymph from body spaces and soaking it into the body cells

CIRCULATORY PATHWAYS

58 Blood pumped by the heart is always circulated through a closed network of blood vessels in:

a. arthropods
b. molluscs
c. annelids
d. chordates
1. Only a and b
2. Only c and d
3. Only a and c
4. Only b and d

59 Consider the two statements:

Assertion (A):	Open circulatory system is considered to be more advantageous than the closed circulatory system.
Reason (R):	Open circulatory system is present in arthropods and molluscs, two of the most successful animal phyla.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	**(A)** is True but **(R)** is False.
3.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
4.	**(A)** is False but **(R)** is True.

60 How many of the given statements are correct:

I:	Fishes have a 2-chambered heart with an atrium and a ventricle.
II:	Amphibians and the reptiles (except crocodiles) have a 3-chambered heart with two atria and a single ventricle.
III:	Crocodiles, birds and mammals possess a 4-chambered heart with two atria and two ventricles.
IV:	The only vertebrates where the heart pumps out deoxygenated blood are fishes.

1.	1	2.	2
3.	3	4.	4

61 Identify the correct statements:

I:	Humans have a closed circulatory system.
II:	Arthropods have an open circulatory system.

1. Only **I**
2. Only **II**
3. Both **I** and **II**
4. Neither **I** nor **II**

62 Consider the given two statements:

Assertion (A):	Double circulation includes the passage of blood through the heart twice during one complete cycle
Reason (R):	Double circulation is seen in birds and mammals.

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	Both **(A)** and **(R)** are False.

63 The human heart is derived from embryonic:

1.	Ectoderm	2.	Mesoderm
3.	Endoderm	4.	All three germ layers

64 The human heart:

1.	is derived from embryonic endoderm.
2.	is situated in the thoracic cavity, in between the two lungs.
3.	has the size and shape of a baseball.
4.	is protected by a single walled membranous bag, pericardium.

65 Inter-atrial septum in the human heart is:

1.	a thin muscular wall	2.	a thick muscular wall
3.	a thin membranous wall	4.	a thick membranous wall

66 A four chambered heart is not seen in:

1.	Amphibians	2.	Crocodiles
3.	Birds	4.	Mammals

67 What separates the atria from the ventricles so that the atrial impulse does not spill onto the ventricles?

1.	fibrous skeleton	2.	AV bundle
3.	visceral pericardium	4.	Purkinje fibers

68 The location of the human heart is most accurately described as:

1.	mediastinum of the lungs.
2.	mediastinum of the pericardium.
3.	mediastinum, which is located in the thoracic cavity.
4.	thoracic cavity, which is located in the mediastinum.

69 Consider the given two statements:

Assertion(A):	Blood flows through the human heart in a single, continuous circuit.
Reason(R):	The human heart has four chambers - two auricles and two ventricles.

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	**(A)** is False but **(R)** is True.

70 Consider the given statements:

I:	The opening between the right atrium and the right ventricle is guarded by the tricuspid valve.
II:	A bicuspid or mitral valve guards the opening between the left atrium and the left ventricle.
III:	The openings of the right and the left ventricles into the pulmonary artery and the aorta respectively are provided with the semilunar valves.

1. Only **I** and **II** are correct
2. Only **I** and **III** are correct
3. Only **II** and **III** are correct
4. **I, II** and **III** are correct

71 Semilunar valves:

I:	allow the flow of blood from ventricles to the pulmonary artery or aorta.
II:	prevent any backward flow of blood from the pulmonary artery or aorta into the ventricles.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

72 Match the items given in Column I with those in Column II and select the correct option given below:

	Column I		Column II
a.	Tricuspid valve	(i)	Between left atrium and left ventricle
b.	Bicuspid valve	(ii)	Between right ventricle and pulmonary artery
c.	Semilunar valve	(iii)	Between right atrium and right ventricle

Options:

	a	b	c
1.	iii	i	ii
2.	i	iii	ii
3.	i	ii	iii
4.	ii	i	iii

73 Consider the two statements:

Statement I:	A muscular wall called a septum prevents the mixture of blood between the left and right sides of the heart.
Statement II:	The left ventricle has a thicker musculature when compared to the musculature of the right ventricle.

1. **Statement I** is correct: **Statement II** is incorrect
2. **Statement I** is incorrect: **Statement II** is correct
3. **Statement I** is correct: **Statement II** is correct
4. **Statement I** is incorrect: **Statement II** is incorrect

74 Match each item in Column I with one in Column II and select the correct answer from the codes given:

	Column I		Column II
A.	Mitral valve	a.	Allows blood flow from left atrium to left ventricle
B.	Papillary muscles	b.	Does not allow back opening of AV valves during ventricular systole
C.	AV node	c.	Ensure all chambers do not contract simultaneously
D.	Fibrous band between atrial and ventricular muscle mass	d.	Ensures atria contract before ventricles

Codes

	A	B	C	D
1.	a	b	c	d
2.	b	a	c	d
3.	b	a	d	c
4.	a	b	d	c

75 Identify the correct statement regarding the atrioventricular (AV) valves:

1.	A bicuspid valve is present between the right atrium and right ventricle.
2.	A bicuspid valve is present between the right atrium and right ventricle.
3.	Bicuspid valve is also called as the mitral valve.
4.	AV valves normally prevent the backflow of blood from the atria to the ventricles.

76 Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R):

Assertion (A):	The sino-atrial node is normally the pacemaker of the human heart.
Reason (R):	It is the only auto-excitable part of the nodal tissue of the human heart.

In the light of the above statements choose the correct answer from the options given below:

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	Both **(A)** and **(R)** are False.

77 How many of the given statements are correct?

A:	Left atrium has the thickest musculature in the human heart.
B:	SA node is located in the wall of the right atrium.
C:	Right ventricle pumps oxygenated blood into aorta.
D:	Heart is covered by a double-layered pericardium.
E:	Left atrium receives deoxygenated blood through pulmonary veins.

1. 1
2. 2
3. 3
4. 5

78 Identify the correct chronological arrangement of the components of the cardiac conduction nodal tissue:

1.	SA node, AV bundle, AV node, Purkinje fibers
2.	SA node, AV node, AV bundle, Purkinje fibers
3.	AV node, AV bundle, SA node, Purkinje fibers
4.	AV node, SA node, Purkinje fibers, AV bundle

79 The sinoatrial node (SAN) in the human heart is present in:

1. the right upper corner of the right atrium.
2. the right atrium near the base of inter-atrial septum.
3. the left lower corner of the left atrium.
3. the left atrium near the base of inter-atrial septum.

80 The atrio-ventricular node (AVN) in the human heart is located:

1.	in the right upper corner of the right atrium.
2.	in the lower left corner of the right atrium close to the atrio-ventricular septum.
3.	in the lower right corner of the left atrium close to the atrio-ventricular septum.
4.	in the interventricular septum

81 The nodal musculature of the heart has the capability to generate impulse:

1.	on stimulation by the sympathetic division of the autonomic nervous system
2.	on stimulation by the parasympathetic division of the autonomic nervous system
3.	on stimulation by the somatic neural division of the peripheral nervous system
4.	without any external stimulus

82 Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R):

Assertion (A):	If the SA node does not function, or the impulse generated in the SA node is blocked before it travels down the electrical conduction system, the heart would stop.
Reason (R):	No other part of the nodal tissue of the heart is capable of generating the impulse.

In the light of the above statements choose the correct answer from the options given below:

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	Both **(A)** and **(R)** are False.

83 Purkinje fibers are:

1.	Intrinsic neural fibers in the ventricles
2.	Muscle fibers that interconnect SA node and AV node
3.	Muscle fibers that are distributed in the ventricular musculature
4.	Neural fibers that spread the impulse throughout the ventricular muscle mass

84 In the nodal tissue of the human heart, a conduction delay is seen in:

1.	SA node	2.	AV node
3.	AV bundle	4.	Purkinje fibers

85 If the atrioventricular node is damaged:

1. SA node would not develop action potential
2. atria will fail to contract
3. the impulse will not reach AV node
4. the impulse will not reach ventricles

86 All the following statements regarding joint diastole phase of the cardiac cycle are correct except:

1.	All chambers are in a relaxed state
2.	The AV valves may remain closed in the initial period
3.	Ventricles get filled in the later part
4.	Semilunar valves remain open

87 During the cardiac cycle:

1.	The atrioventricular valves open during systole
2.	The ventricles contract during diastole
3.	The semilunar valves open during ventricular systole
4.	Atrial systole occurs simultaneously with ventricular systole

88 What percentage of the ventricular filling is passive, which means it is due to simply the opening of atrioventricular valves?

1. 30%
2. 50%
3. 70%
4. 90%

89 During an ongoing cardiac cycle, the atria of the heart are in systole. Which of the following will also be true?

1.	The ventricles are also in systole.
2.	The atrioventricular valves are closed.
3.	Blood is being pumped into the aorta and pulmonary trunk.
4.	Blood is being pumped into the ventricles.

90 Consider the two statements:

Statement I:	The contraction of both atria delivers about 80% of the total volume of blood to the ventricles for subsequent ejection.
Statement II:	Normally, both atria contract at the same time, followed shortly by both ventricles contracting at the same time.

1. **Statement I** is correct; **Statement II** is incorrect
2. **Statement I** is incorrect; **Statement II** is correct
3. **Statement I** is correct; **Statement II** is correct
4. **Statement I** is incorrect; **Statement II** is incorrect

91 If the average duration of cardiac cycle were 0.6 seconds, the number of cardiac cycles per minute will be about:

1.	60	2.	75
3.	72	4.	100

92 During ventricular diastole:

I:	closure of semilunar valves occurs.
II:	the tricuspid and bicuspid valves are pushed open.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

93 The atrial systole increases the flow of blood into the ventricles by about:

1.	10 percent	2.	30 percent
3.	50 percent	4.	70 percent

94 During cardiac cycle:

1.	all the four chambers of heart can never be in a relaxed state simultaneously.
2.	as the tricuspid valve gets open, blood from the pulmonary artery flows into the right ventricle.
3.	all the four chambers of heart can never be in a contracted state simultaneously.
4.	as the bicuspid valve gets open, blood from the aorta flows into the left ventricle.

95 When the passive filling of the ventricles is taking place during a cardiac cycle:

I:	The atria are in diastole.
II:	The semi-lunar valves are closed.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

96 During the ventricular systole:

I:	The atria also undergo systole
II:	The atrioventricular valves get closed
III:	The semilunar valves are forced open

1. Only **I** and **II** are correct
2. Only **I** and **III** are correct
3. Only **II** and **III** are correct
4. **I, II** and **III** are correct

97 Consider the given two statements:

Assertion (A):	Human heart is myogenic.
Reason (R):	Human heart is made of cardiac muscle.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**
2.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**
3.	**(A)** is True but **(R)** is False
4.	**(A)** is False but **(R)** is True

98 During a cardiac cycle, the ventricular systole will lead to:

1. ventricular filling.
2. the atrioventricular valves to close, and then the semilunar valves to open.
3. the semilunar valves to close, and then the atrioventricular valves to open.
4. pressure to become greater in the aorta and pulmonary trunk than in the ventricles.

99 The semilunar valves will open during a normal cardiac cycle when the pressure in the left ventricle is

1. greater than the pressure in the aorta.
2. less than the pressure in the aorta.
3. the same as the pressure in the aorat.
4. less than the pressure in the left atrium.

100 During ventricular contraction in a cardiac cycle:

1. the AV valves close earlier than the opening of semi lunar vales
2. the AV valves close earlier than the closure of semi lunar vales
3. the AV valves close later than the opening of semi lunar vales
4. the closure of AV valves and opening of semi lunar valves occur simultaneously

101 Which among the following is correct during each cardiac cycle?

1. The volume of blood pumped by right and left ventricles is same
2. The volume of blood pumped by right and left ventricles is different
3. The volume of blood received by right and left atria is different
4. The volume of blood received by pulmonary arteries and aorta is different

102 Blood enters the heart because muscles of the:

1.	ventricles relax	2.	ventricles contract
3.	atria relax	4.	atria contract

103 Identify the state in which the atria and the ventricles are when most of the ventricular filling occurs:

1. Both the atria and ventricles are in systole
2. The atria are in diastole and the ventricles are in systole
3. Both the atria and ventricles are in diastole
4. The atria are in systole and the ventricles are in diastole

104 Cardiac output is defined as

1. blood pressure X stroke volume.
2. peripheral resistance X heart rate.
3. heart rate X stroke volume.
4. Systolic pressure – diastolic pressure.

105 A trained athlete can achieve a maximal cardiac output of:

1.	5 – 10 L/min	2.	15 – 20 L/min
3.	25 – 30 L/min	4.	55 – 60 L/min

106 The volume of blood pumped out by each ventricle per minute is called as the:

1. stroke volume
2. ejection fraction
3. cardiac output
4. end diastolic volume

107 A person has a cardiac output of 6000 ml per minute. 20% of this is received by kidneys. What is the renal plasma flow in this person?

1. 480 ml
2. 660 ml
3. 800 ml
4. 1200 ml

108 A healthy male has a resting cardiac output of 6000 ml per minute with a stroke volume of 80 ml. What is the heart rate of this person?

1.	72 per minute	2.	75 per minute
3.	80 per minute	4.	100 per minute

109 Consider the two statements:

Assertion(A):	The cardiac output of an athlete will be much higher than that of an ordinary man.
Reason(R):	The body has the ability to alter the stroke volume as well as the heart rate and thereby the cardiac output.

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	**(A)** is True but **(R)** is False.
3.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**
4.	**(A)** is False and **(R)** is True.

110 Which of the following best describes the correlation between heart sounds and events of the cardiac cycle?

1.	The first heart sound (S1), also known as "lub," is produced by the closing of the semilunar valves at the beginning of systole.
2.	The second heart sound (S2), also known as "dub," is produced by the closing of the atrioventricular valves at the end of systole.
3.	The first heart sound (S1), also known as "lub," is produced by the closing of the atrioventricular valves at the beginning of systole.
4.	The second heart sound (S2), also known as "dub," is produced by the reopening of the atrioventricular valves at the beginning of diastole.

111 The first heart sound is heard during:

1.	beginning of ventricular systole
2.	end of ventricular systole
3.	atrial systole
4.	ventricular ejection

112 Match each item in Column I with one in Column II and select the correct answer from the codes given:

	Column I		**Column II**
A.	Closure of AV valves	a.	Second heart sound
B.	Closure of semilunar valves	b.	First heart sound
C.	Opening of AV valves	c.	Ventricular ejection
D.	Opening of semilunar valves	d.	Passive ventricular filling

Codes

	A	B	C	D
1.	a	b	c	d
2.	b	a	c	d
3.	b	a	d	c
4.	a	b	d	c

113 Both heart rate and stroke volume in a human get doubled during exercise. His cardiac output will:

1.	double	2.	become four times
3.	become eight times	4.	remain the same

114 Identify the incorrectly matched pair:

1. Average duration of a cardiac cycle: 0.8 sec
2. Stroke volume of each ventricle: 120 ml
3. Highest normal systolic blood pressure: 140 mm Hg
4. Highest normal diastolic blood pressure: 90 mm Hg

115 What does the 'P' wave in an ECG represent?

1. Ventricular depolarization
2. Atrial repolarization
3. Ventricular repolarization
4. Atrial depolarization

116 Which of the following events is not represented as a wave on the standard ECG?

1. Depolarisation of atria
2. Repolarisation of atria
3. Depolarisation of ventricles
4. Repolarisation of ventricles

117 Regarding normal ECG tracings:

I:	The P-wave represents the electrical excitation (or depolarization) of the atria.
II:	The QRS complex represents the depolarization of the ventricles, which initiates the ventricular contraction.
III:	The end of the T-wave marks the end of diastole.

1. Only **I** and **II** are correct
2. Only **I** and **III** are correct
3. Only **II** and **III** are correct
4. **I, II** and **III** are correct

118 Consider the two statements:

Assertion (A):	Any deviation from the normal shape of ECG indicates a possible abnormality or disease.
Reason (R):	The ECGs obtained from different individuals have roughly the same shape for a given lead configuration.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	**(A)** is True but **(R)** is False.
3.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
4.	**(A)** is False but **(R)** is True.

119 What wave of the ECG represents ventricular repolarization?

1.	P	2.	Q
3.	R	4.	T

120 Which tracing on the standard ECG leads to contraction of the ventricles during a cardiac cycle?

1.	P wave	2.	QRS complex
3.	ST segment	4.	T wave

121 To obtain a standard ECG, a patient is connected to the machine with three electrical leads including all the following except:

1.	One to right wrist	2.	One to left wrist
3.	One to right ankle	4.	One to left ankle

122 The period of systole is represented on surface ECG as between:

1. Beginning of P wave and beginning of Q wave
2. End of S wave and beginning of T wave
3. Shortly after Q wave and end of the T wave
4. Two successive R waves

DOUBLE CIRCULATION

123 The innermost layer of blood vessel walls made up of one layer of endothelium and in direct contact with the blood is:

1. tunica adventitia	2. tunica intima
3. tunica media	4. tunica muscularis

124 At which point, the pulmonary artery is different from the pulmonary vein:

1. Its lumen is broad
2. Its wall is thick
3. It has valves
4. It does not possess endothelium

125 Identify the correctly matched pairs:

	Layer in the wall of artery/vein	Made up of
I:	Tunica intima	Squamous epithelium
II:	Tunica media	Skeletal muscle/elastic fibres
III:	Tunica externa	Fibrous connective tissue

1. Only **I** and **II** are correct
2. Only **I** and **III** are correct
3. Only **II** and **III** are correct
4. **I, II** and **III** are correct

126 A vein, in general, can be distinguished from an artery by:

1.	Absence of valves	2.	Thin tunica media
3.	Absence of tunica externa	4.	Absence of tunica media

127 When compared to the wall of a typical vein, the wall of a typical artery will show a well developed:

1.	Tunica intima	2.	Tunica media
3.	Tunica externa	4.	Tunica albuginea

128 The correct path of circulation of the blood in the human heart is represented by:

1.	left atrium, left ventricle, lungs, right atrium, right ventricle, body
2.	right atrium, right ventricle, lungs, left atrium, left ventricle, body
3.	left atrium, left ventricle, right atrium, right ventricle, lungs, body
4.	right atrium, lungs, right ventricle, left atrium, body, left ventricle

129 Pulmonary veins return the oxygenated blood from the lungs to:

1.	right atrium	2.	left atrium
3.	right ventricle	4.	left ventricle

130 The deoxygenated blood from the cardiac muscles is returned to the right atrium by:

1.	coronary sinus	2.	pre-caval vein
3.	post-caval vein	4.	pulmonary veins

131 The right ventricle of the heart pumps blood into the:

1.	pulmonary circulation	2.	systemic circulation
3.	coronary circulation	4.	portal circulation

132 The atria receive:

1.	Oxygenated blood	2.	Deoxygenated blood
3.	Mixed blood	4.	Venous blood

133 The 'double circulation' of humans includes:

I: Systemic circulation
II: Coronary circulation
III: Pulmonary circulation
IV: Portal circulation

1.	I and III only	2.	I and II only
3.	II and IV only	4.	II and III only

134 Consider the two given statements:

I:	Pulmonary circulation carries deoxygenated blood to the lungs and brings oxygenated blood back to the heart.
II:	The systemic circulation provides nutrients, oxygen and other essential substances to the tissues and takes carbon dioxide and other harmful substances away for elimination.

1. Only I is correct
2. Only II is correct
3. Both I and II are correct
4. Both I and II are incorrect

135 Identify the correct statements:

I:	pulmonary arteries carry oxygen-poor blood
II:	pulmonary veins carry blood towards the lung capillaries
III:	blood returning to the left atrium of the heart is oxygen-poor
IV:	oxygen from the blood diffuses into the air sacs (alveoli) of the lungs

1. Only I
2. Only I and III
3. I, II, III and IV
4. Only II and III

136

Assertion(A):	Left ventricle pumps more blood than the right ventricle
Reason(R):	Left ventricle pumps deoxygenated blood and the right ventricle pumps oxygenated blood.

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	**(A)** is False but **(R)** is False.

137 Which of the following statement(s) about pulmonary and systemic circulation is/are correct?

A:	Pulmonary circulation transports oxygen-rich blood from the heart to the rest of the body, while systemic circulation brings oxygen-poor blood back to the heart.
B:	Pulmonary circulation carries oxygen-poor blood from the heart to the lungs and returns oxygen-rich blood back to the heart, while systemic circulation moves oxygen-rich blood from the heart to the body and returns oxygen-poor blood to the heart.

1. Only **A**
2. Only **B**
3. Both **A** and **B**
4. Neither **A** nor **B**

138 Which statement is true about double circulation in mammals?

I:	The pulmonary circuit sends de-oxygenated blood to the lungs, while the systemic circuit circulates oxygenated blood to the rest of the body.
II:	Double circulation includes two separate circuits for oxygenated and deoxygenated blood, which never mix.
III:	In double circulation, blood passes twice through the heart in one complete cycle of the body.

1. Only **I** and **II** are correct
2. Only **I** and **III** are correct
3. Only **II** and **III** are correct
4. **I, II** and **III** are correct

139 The primary difference between an artery and a vein is that:

A:	Arteries carry blood away from the heart, and veins carry blood towards the heart.
B:	Veins contain valves, whereas arteries do not.
C:	Arteries carry only oxygenated blood, while veins carry only deoxygenated blood.

1. **A** and **B** are correct
2. **B** and **C** are correct
3. **A** and **C** are correct
4. **A, B** and **C** are correct

140 The portal systems seen in humans include:

I: Hepatic portal system
II: Renal portal system
III: Hypothalamic Hypophyseal portal system

1.	**I** and **II** only	2.	**I** and **III** only
3.	**II** and **III** only	4.	**I, II** and **III**

141 The hepatic portal vein drains blood to liver from:

1. Stomach	2. Kidneys
3. Intestine	4. Heart

REGULATION OF CARDIAC ACTIVITY

142 Normal activities of the human heart are regulated:

1. Intrinsically
2. By the autonomic nervous system
3. By the somatic neural system
4. By the adrenal medullary hormones

143 Consider the two statements:

Assertion (A):	The human heart is called as myogenic.
Reason (R):	The human heart is made up of cardiac muscles.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	**(A)** is True but **(R)** is False.
3.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
4.	**(A)** is False but **(R)** is True.

144 The activities of the human heart can be regulated through the autonomic nervous system by a special neural center located in:

1.	Medulla oblongata	2.	Hypothalamus
3.	Mid brain	4.	Cerebrum

145 Consider the given two statements:

Assertion (A)	Neural signals through the sympathetic nerves (part of ANS) can increase the cardiac output.
Reason (R):	Neural signals through the sympathetic nerves can increase the rate of heart beat and the strength of ventricular contraction.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	Both **(A)** and **(R)** are False.

146 Which of the following statements accurately describes the regulation of cardiac activity by the autonomic nervous system?

1.	The sympathetic nervous system decreases heart rate and force of contraction.
2.	The parasympathetic nervous system increases heart rate and decreases force of contraction.
3.	The sympathetic nervous system increases heart rate and force of contraction.
4.	The parasympathetic nervous system increases both heart rate and force of contraction.

147 The cardiac output can be increased by:

I.	Sympathetic neural signals
II.	Adrenal cortical hormones

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

148 Consider the two statements:

Assertion (A):	Adrenal medullary hormones can increase the cardiac output.
Reason (R):	Adrenal medullary hormones are steroids with prominent effects on osmoregulation and glucose homeostasis in human body.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	**(A)** is True but **(R)** is False.
3.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
4.	**(A)** is False but **(R)** is True.

149 Consider the given two statements:

Assertion (A):	The parasympathetic nervous system increases cardiac output.
Reason (R):	The parasympathetic nervous system increases the heart rate and the strength of the heartbeat.

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is False, **(R)** is False.
4.	**(A)** is False, **(R)** is True.

DISORDERS OF CIRCULATORY SYSTEM

150 Which of the following recordings in a sphygmomanometer will not be considered as 'hypertension'?

1. 150/80 mm Hg
2. 130/100 mm Hg
3. 160/96 mm Hg
4. 130/70 mm Hg

151 The build-up of fats, cholesterol and other substances in and on the artery walls is known as:

1.	arteriosclerosis	2.	atherosclerosis
3.	aneurysm	4.	anastomosis

152 Most cases of CAD result from:

1.	Angina pectoris	2.	Myocardial infarction
3.	Atherosclerosis	4.	Heart failure

153 A medical term used to describe chest pain or discomfort that occurs when an area of the heart muscle doesn't get enough oxygen-rich blood is known as:
1. Heart Block
2. Myocardial Infarction
3. Angina pectoris
4. Tachycardia

154 Consider the two statements:

Assertion (A):	Heart failure is sometimes called congestive heart failure.
Reason (R):	Heart failure means the state of heart when it is not pumping blood effectively enough to meet the needs of the body.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	**(A)** is True but **(R)** is False.
3.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
4.	**(A)** is False but **(R)** is True.

155 Match each item in Column I with one in Column II and select the correct answer from the codes given:

	Column I		**Column II**
A.	Heart failure	a.	Lowered ejection fraction of a ventricle
B.	Heart attack	b.	Damage to the cardiac muscle
C.	Heart block	c.	Abnormal delay in conduction in nodal tissue
D.	Cardiac arrest	d.	Sudden stoppage of the heart

Codes

	A	B	C	D
1.	a	b	c	d
2.	b	a	c	d
3.	b	a	d	c
4.	a	d	b	c

156 The main consequence of a blockage in the coronary artery is most likely to be:
1. Reduced oxygen supply to the brain.
2. Increased blood pressure.
3. Myocardial infarction (heart attack).
4. Decrease in venous return.

BODY FLUIDS AND CIRCULATION - ANSWER KEY

1.	(4)	2.	(2)	3.	(2)	4.	(2)	5.	(4)	6.	(3)	7.	(2)	8.	(1)	9.	(2)	10.	(2)
11.	(1)	12.	(2)	13.	(4)	14.	(4)	15.	(2)	16.	(3)	17.	(1)	18.	(4)	19.	(1)	20.	(3)
21.	(4)	22.	(3)	23.	(1)	24.	(4)	25.	(1)	26.	(3)	27.	(1)	28.	(2)	29.	(2)	30.	(4)
31.	(3)	32.	(3)	33.	(2)	34.	(1)	35.	(4)	36.	(2)	37.	(2)	38.	(1)	39.	(3)	40.	(3)
41.	(3)	42.	(1)	43.	(1)	44.	(3)	45.	(2)	46.	(1)	47.	(4)	48.	(3)	49.	(3)	50.	(2)
51.	(1)	52.	(2)	53.	(3)	54.	(3)	55.	(4)	56.	(2)	57.	(3)	58.	(2)	59.	(4)	60.	(3)
61.	(3)	62.	(2)	63.	(2)	64.	(2)	65.	(1)	66.	(1)	67.	(1)	68.	(3)	69.	(4)	70.	(4)
71.	(3)	72.	(1)	73.	(3)	74.	(4)	75.	(3)	76.	(3)	77.	(2)	78.	(2)	79.	(1)	80.	(2)
81.	(4)	82.	(4)	83.	(3)	84.	(2)	85.	(4)	86.	(4)	87.	(3)	88.	(3)	89.	(4)	90.	(2)
91.	(4)	92.	(3)	93.	(2)	94.	(3)	95.	(3)	96.	(3)	97.	(2)	98.	(2)	99.	(1)	100.	(1)
101.	(1)	102.	(3)	103.	(3)	104.	(3)	105.	(3)	106.	(3)	107.	(2)	108.	(2)	109.	(1)	110.	(3)
111.	(1)	112.	(3)	113.	(2)	114.	(2)	115.	(4)	116.	(2)	117.	(1)	118.	(1)	119.	(4)	120.	(2)
121.	(3)	122.	(3)	123.	(2)	124.	(2)	125.	(2)	126.	(2)	127.	(2)	128.	(2)	129.	(2)	130.	(1)
131.	(1)	132.	(4)	133.	(1)	134.	(3)	135.	(1)	136.	(4)	137.	(2)	138.	(4)	139.	(1)	140.	(2)
141.	(3)	142.	(1)	143.	(3)	144.	(1)	145.	(1)	146.	(3)	147.	(1)	148.	(2)	149.	(3)	150.	(4)
151.	(2)	152.	(3)	153.	(3)	154.	(3)	155.	(1)	156.	(3)								

INTRODUCTION - LOCOMOTION AND MOVEMENT

1 Consider the given two statements:

Statement I:	Locomotory structures need not be different from those affecting other types of movements.
Statement II:	All movements are locomotions but all locomotions are not movements.

1. **Statement I** is correct; **Statement II** is correct
2. **Statement I** is correct; **Statement II** is incorrect
3. **Statement I** is incorrect; **Statement II** is correct
4. **Statement I** is incorrect; **Statement II** is incorrect

TYPES OF MOVEMENT

2 Which of the following movements can be seen in a human body?

I. Amoeboid	II. Ciliary	III. Flagellar

1.	I and II only	2.	I and III only
3.	II and III only	4.	I, II and III

3 Cells of human body exhibit three main types of movements. Cytoskeleton elements called microfilaments play an important role in:

A. Amoeboid movements
B. Ciliary movements
C. Muscular movements

1.	Only A	2.	Only A and B
3.	Only A and C	4.	A, B and C

4 Identify the correct statements:

I:	Macrophages in body and leucocytes in blood exhibit amoeboid movement.
II:	Passage of ova through the female reproductive tract is facilitated by the ciliary movement.
III:	Human sperm moves with the help of flagellum

1. Only **I** and **II**
2. Only **I** and **III**
3. Only **II** and **III**
4. **I, II** and **III**

5 The types of movements exhibited by various cells in human body include:

I:	Amoeboid
II:	Ciliary
III:	muscular

1. Only **III**
2. Only **I** and **II**
3. Only **II** and **III**
4. **I, II** and III

6 Ciliary movements in the human body help in:

I:	removing dust particles and some of the foreign substances inhaled along with the atmospheric air.
II:	passage of urine in the collecting duct of the nephron.
III:	passage of ova through the female reproductive tract

1. Only **I** and **II** are correct
2. Only **I** and **III** are correct
3. Only **II** and **III** are correct
4. **I, II** and **III** are correct

MUSCLE

7 The muscle tissue in animals is a derivative of embryonic:

1. Ectoderm
2. Mesoderm
3. Endoderm
4. Partly ectoderm and partly endoderm

8 Muscle:

I:	is derived from embryonic endoderm
II:	constitutes about 40-50 percent of human body

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

9 Skeletal muscles are:

1.	Striated, Multinucleate and Voluntary
2.	Non-Striated, Multinucleate and Voluntary
3.	Striated, Multinucleate and Involuntary
4.	Non-Striated, Uni-nucleate and Voluntary

10 Identify the correct statements:

I:	Skeletal muscles are striated and voluntary
II:	Smooth muscles are striated and involuntary
III:	Cardiac muscles are striated and involuntary

1. Only **I** and **II**
2. Only **I** and **III**
3. Only **II** and **III**
4. **I, II** and **III**

11 Consider the given two statements:

Assertion (A):	Skeletal muscles are striated and voluntary.
Reason (R):	They are controlled by the autonomic nervous system.

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	**(A)** is False but **(R)** is True.

12 Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R):

Assertion (A):	Smooth muscle is fundamentally different from skeletal muscle and cardiac muscle.
Reason (R):	Smooth muscle is an involuntary non-striated muscle.

In the light of the above statements choose the correct answer from the options given below:

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	Both **(A)** and **(R)** are False.

13 What type of muscles do you expect to find in the inner walls of hollow visceral organs?

1.	Involuntary, nonstriated	2.	Voluntary, nonstriated
3.	Involuntary, striated	4.	Voluntary, striated

14 Consider the given two statements:

Assertion (A):	Smooth muscles are voluntary muscles.
Reason (R):	They are under conscious control and allow for purposeful movements

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	Both **(A)** and **(R)** are False.

15 Bundles of skeletal muscle fibres called fascicles are enclosed by a connective tissue known as:

1.	Fascia	2.	Perimysium
3.	Endomysium	4.	Epimysium

16 Identify the incorrect statement:

1.	A skeletal muscle cell is called as a muscle fibre.
2.	A skeletal muscle fibre is a syncytium.
3.	Sarcolemma, the plasma membrane of skeletal muscle cell, encloses the sarcoplasm.
4.	Sarcoplasmic reticulum of the muscle fibres is a rough endoplasmic reticulum and is involved in excessive protein synthesis.

17 Regarding a skeletal muscle fibre:

I:	It is a syncytium.
II:	It has sarcoplasmic reticulum [a type of smooth ER] that stores calcium.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

18 The dark and light bands seen as striations in a skeletal muscle are located on:

1.	Myofilaments	2.	Muscle fiber
3.	Myofibril	4.	Motor unit

19 The correct statement regarding myofibril would be:

1.	It is the name for a muscle cell.
2.	It contains sarcoplasmic reticulum.
3.	It is made up of many sarcomeres.
4.	It is a bundle of muscle cells.

20 Consider the given two statements:

Statement I:	Thick filaments within the myofibril are composed primarily of actin.
Statement II:	Thin filaments within the myofibril are composed primarily of myosin.

1. **Statement I** is correct; **Statement II** is correct
2. **Statement I** is correct; **Statement II** is incorrect
3. **Statement I** is incorrect; **Statement II** is correct
4. **Statement I** is incorrect; **Statement II** is incorrect

21 The number of correct statements from the statements given below will be:

I:	The striated appearance of skeletal muscle myofibril is due to the distribution pattern of two important proteins – Actin and Myosin.
II:	The light band contains actin and is called as I-band or Isotropic band.
III:	Actin and myosin in a myofibril are arranged as rod-like structures, parallel to each other and also to the longitudinal axis of the myofibrils.
IV:	Actin filaments are thinner as compared to the myosin filaments.

1.	1	2.	2
3.	3	4.	4

22 The central part of the thick filaments not overlapped by the thin filaments is called as:

1.	A band	2.	I band
3.	H zone	4.	Sarcomere

23 The smallest, functional unit of contraction is the:

1.	muscle fiber	2.	sarcomere
3.	myofilament	4.	myofibril

24 The Z line is present in:

1.	A band	2.	H zone
3.	I band	4.	M line

25 The part of the sarcomere that is composed of only myosin myofilaments is:

1.	A band	2.	I band
3.	M line	4.	H zone

26 Identify the incorrect statement regarding a sarcomere:

1.	Anisotropic band mainly contains myosin.
2.	Isotropic band consists of actin.
3.	The thick filaments are held together by an M-line.
4.	Actin and myosin are arranged perpendicular to each other and also to the longitudinal axis of myofibrils.

27 Consider the given two statements:

Statement I:	The portion of the myofibril between two successive 'Z' lines is considered as the functional unit of contraction and is called a sarcomere.
Statement II:	In a resting state, the edges of thin filaments on either side of the thick filaments partially overlap the free ends of the thick filaments.
Statement III:	The central part of thick filament, not overlapped by thin filaments is called the 'H' zone.

1.	**Statement I** is correct; **Statement II** is correct; **Statement III** is correct
2.	**Statement I** is correct; **Statement II** is incorrect; **Statement III** is correct
3.	**Statement I** is incorrect; **Statement II** is correct; **Statement III** is incorrect
4.	**Statement I** is incorrect; **Statement II** is incorrect; **Statement III** is incorrect

28 Regarding the ultra-structure of a sarcomere, the Z line corresponds to:

1.	a band where only actin molecules are found
2.	a band where only myosin molecules are found
3.	an attachment point for actin molecules
4.	an attachment point for myosin molecules

29 Identify the incorrect statement regarding the ultra-structure of a skeletal muscle:

1.	Z lines bisect the I band
2.	G actin is a polymer of F actins
3.	A subunit of troponin masks active binding sites for myosin on the actin filament.
4.	Globular head of myosin has ATPase activity.

30 Consider the following statements:

I:	The head of myosin is made of LMM and the tail is made of HMM
II:	F Actin is monomeric while G actin is polymeric
III:	Tropomyosin is composed of three globular proteins

The incorrect statements are:

1. **I** and **II** only	2. **I** and **III** only
3. **II** and **III** only	4. **I, II** and **III**

31 What protein is arranged along the length of actin filaments and is involved in regulation of skeletal muscle contraction?

1.	Troponin	2.	Calmodulin
3.	Tropomyosin	4.	Light meromyosin

32 Which of the following masks the active sites on actin when a skeletal muscle is relaxed?

1.	Tropomyosin	2.	Troponin
3.	Calmodulin	4.	Ubiquitin

33 Consider the given two statements:

Statement I:	A single filament of tropomyosin runs close to the 'F' actins throughout its length.
Statement II:	In the resting state, a subunit of troponin masks the active binding sites for myosin on the actin filaments.

1. **Statement I** is correct; **Statement II** is correct
2. **Statement I** is correct; **Statement II** is incorrect
3. **Statement I** is incorrect; **Statement II** is correct
4. **Statement I** is incorrect; **Statement II** is incorrect

34 ATPase activity is found in:

1.	Myosin head	2.	Myosin tail
3.	G-Actin	4.	Troponin

35 The head of the myosin myofilament has sites for:

I:	binding to active sites on actin myofilaments
II:	binding to ADP

1. Only **I**
2. Only **II**
3. Both **I** and **II**
4. Neither **I** nor **II**

36 Contraction of a skeletal muscle fibre takes place by:

1.	shortening of both actin and myosin myofilaments
2.	shortening of actin and lengthening of myosin myofilaments
3.	the sliding of the thin filaments over the thick filaments
4.	the sliding of the thick filaments over the thin filaments

37 A motor unit is composed of:

1.	a motor neuron and all of the skeletal muscle fibers innervated by the neuron's axon terminals.
2.	all motor neurons and all of the skeletal muscle fibers innervated by them in a muscle.
3.	a motor neuron and one skeletal muscle fiber innervated by the neuron.
4.	a motor neuron and a sensory neuron.

38 Consider the given two statements:

Statement I:	The junction between a motor neuron and the sarcolemma of the muscle fibre is called the neuromuscular junction.
Statement II:	A neural signal reaching the neuromuscular junction releases a neurotransmitter, Acetyl choline, which generates an action potential in the sarcolemma.

1. **Statement I** is correct; **Statement II** is correct
2. **Statement I** is correct; **Statement II** is incorrect
3. **Statement I** is incorrect; **Statement II** is correct
4. **Statement I** is incorrect; **Statement II** is incorrect

39 The neurotransmitter released by the motor neurons at the neuromuscular junction is:

1.	Acetylcholine	2.	Noradrenaline
3.	GABA	4.	Adrenaline

40 Calcium released into the sarcoplasm during muscle contraction:

1.	binds to the actin and myosin and makes them work together.
2.	breaks apart ATP to ADP and P.
3.	removes the tropomyosin block.
4.	causes the release of acetylcholine.

41 The critical event for the contraction of striated muscles would be that calcium ions:

1.	are released from troponin C
2.	bind to tropomyosin
3.	bind to troponin
4.	are taken up by the sarcoplasmic reticulum

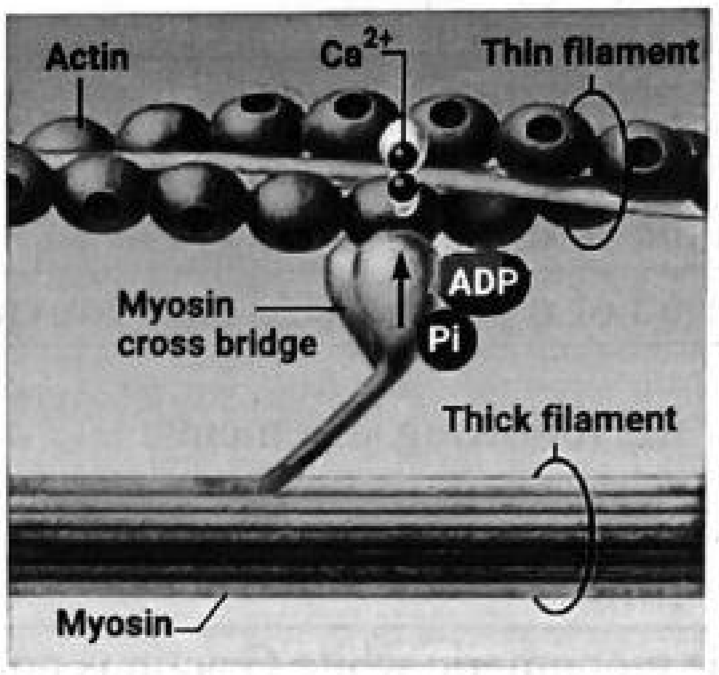
42 To form a cross bridge, during muscle contraction:

1.	the myosin head binds to the exposed active sites on actin utilising the energy from ATP hydrolysis
2.	the myosin head binds to the exposed active sites on actin and then the ATP binds to its site on myosin head
3.	the actin binds to the exposed active sites on myosin head utilising the energy from ATP hydrolysis
4.	the actin binds to the exposed active sites on myosin head and then the ATP binds to its site on actin

43 During muscle contraction, when the myosin head releases ADP and iP it:

1. forms cross bridge with actin
2. pulls actin towards M-line
3. goes back to its relaxed state
4. gets detached from the cross bridge

44 During muscle contraction, the event shown in the following diagram describes:



1. cross bridge detachment
2. the power stroke or working stroke
3. cross bridge formation
4. cocking of myosin head

45 Cross bridge formation during muscle contraction involves:

1.	troponin and actin	2.	tropomyosin and myosin
3.	myosin and troponin	4.	myosin and actin

46 Consider the given two statements regarding the cycle of events taking place during skeletal muscle contraction:

Statement I:	The myosin, hydrolysing ATP into ADP and Pi goes back to its relaxed state.
Statement II:	Cross bridge is broken when myosin releases ADP and Pi.

1. **Statement I** is correct; **Statement II** is correct
2. **Statement I** is correct; **Statement II** is incorrect
3. **Statement I** is incorrect; **Statement II** is correct
4. **Statement I** is incorrect; **Statement II** is incorrect

47 The process of skeletal muscle contraction continues till:

1.	Myosin goes back to its relaxed state.
2.	A cross bridge is formed.
3.	Ca^{2+} ions are pumped back to the sarcoplasmic cisternae.
4.	Lactic acid accumulates in the muscle

48 Arrange the given events in the correct chronological sequence of their occurrence [earliest to last] in which they occur during a single stimulation of a skeletal muscle.

A. active sites on actin myofilament are exposed
B. actin myofilament slides over myosin myofilament
C. Ca^{2+} ion binds to troponin
D. myosin heads move
E. cross bridges form
1. E – A – C – D - B
2. A – C – E – D - B
3. C – A – E – D - B
4. C – E – A – D - B

49 During relaxation of a skeletal muscle:

1.	Calcium ions that are bound to troponin C now bind to troponin A
2.	Cross bridge formation between myosin head and actin takes place
3.	The A band of the sarcomere lengthens
4.	Calcium ions are pumped back to the sarcoplasmic cisternae

50 With respect to the red muscle fibers [Type I], the white muscle fibers [Type II] are richer in:

1.	Blood capillaries	2.	Myoglobin
3.	Sarcoplasmic reticulum	4.	Mitochondria

51 All the following regarding red muscle fibers are true except:

1.	They are adapted for slow and sustained activity
2.	They have a high content of myoglobin
3.	They are rich in mitochondria
4.	They depend on anaerobic process for energy

52 Consider the following two statements:

Statement I:	Red fibres are 'red' due to large amount of myoglobin.
Statement II:	Red muscles are also called as aerobic muscles.

1.	Both **Statement I** and **Statement II** are correct and **Statement II** explains **Statement I**
2.	Both **Statement I** and **Statement II** are correct but **Statement II** does not explain **Statement I**
3.	**Statement I** is correct but **Statement II** is incorrect
4.	**Statement I** is incorrect but **Statement II** is correct

53 The number of correct statement(s) from the given statements is/are:

I:	Myoglobin content is very low in the red fibres.
II:	white muscle fibers contain plenty of mitochondria.
III:	The amount of sarcoplasmic reticulum is high in red muscle fibers.
IV:	White muscle fibres depend on anaerobic process for energy.

1. 0
2. 1
3. 2
3. 3

54

Assertion(A):	Red muscle fibres are adapted to sudden outburst of muscular activity.
Reason(R):	Red muscle fibres are extremely rich in sarcoplasmic reticulum.

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	**(A)** is False and **(R)** is False.

55 What is a key difference between red muscle fibers and white muscle fibers?

1.	Red muscle fibers are adapted for endurance and have a high myoglobin content, while white muscle fibers are designed for short bursts of activity and contain less myoglobin.
2.	White muscle fibers are rich in myoglobin, whereas red muscle fibers are not.
3.	Red muscle fibers are smaller in diameter than white muscle fibers.
4.	White muscle fibers have more mitochondria than red muscle fibers.

56 Consider the given two statements:

Statement I:	Repeated activation of the muscles can lead to fatigue.
Statement II:	Repeated activation of the muscles can lead to the accumulation of lactic acid due to anaerobic breakdown of glycogen in them.

1.	**Statement I** is correct; **Statement II** is correct
2.	**Statement I** is correct; **Statement II** is incorrect
3.	**Statement I** is incorrect; **Statement II** is correct
4.	**Statement I** is incorrect; **Statement II** is incorrect

57 The immediate source of chemical energy that can be used by skeletal muscle tissue to allow muscle contraction is:

1.	glucose	2.	glycogen
3.	ATP	4.	creatine phosphate

SKELETAL SYSTEM

58 What is number of bones in a human adult?

1.	150	2.	300
3.	250	4.	206

59 All the following are parts of human axial skeleton except:

1.	Sternum	2.	Vertebrae
3.	Hyoid	4.	Scapula

60 Identify the incorrect statement:

I:	Axial skeleton comprises 80 bones distributed along the main axis of the body.
II:	The skull is composed of 22 bones.
III:	Cranial bones are 14 in number.
IV:	The facial region is made up of 8 skeletal elements which form the front part of the skull.

1. Only **I** and **II**
2. Only **III** and **IV**
3. Only **II**, **III** and **IV**
4. Only **I**

61 Consider the given statements regarding the human skull:

I:	It has a total of 22 bones.
II:	Cranial bones are 14 in number and the facial bones are 8 in number.
III:	It is monocondylic.
IV:	A single hyoid bone is located at the base of the buccal cavity.

The correct statements include:

1.	Only **I**	2.	Only **I** and **IV**
3.	Only **II** and **III**	4.	Only **I**, **II**, and **IV**

62 Identify the incorrect statement:

1. The human skull is monocondylic
2. The human ribs are bicephalic
3. The human mandible is craniostylic
4. Patella is a sesamoid bone

63 Consider the given two statements:

Statement I:	A single U-shaped bone called hyoid is present at the base of the buccal cavity and it provides attachment to the tongue.
Statement II:	The skull region articulates with the superior region of the vertebral column with the help of two occipital condyles (dicondylic skull).

1. **Statement I** is correct; **Statement II** is correct
2. **Statement I** is correct; **Statement II** is incorrect
3. **Statement I** is incorrect; **Statement II** is correct
4. **Statement I** is incorrect; **Statement II** is incorrect

64 Which of the following bones will not be a part of the facial skeleton of human skull?

1.	Ethmoid	2.	Zygomatic
3.	Mandible	4.	Maxilla

65 Which of the following bones will not be a part of the cranial skeleton of human skull?

1.	Temporal	2.	Zygomatic
3.	Parietal	4.	Occipital

66 The ear ossicles include:

1.	anvil, stapes, and incus	2.	stapes, malleus, and incus
3.	malleus, hammer, and stirrup	4.	annulus, hyoid, and vestibular

67 The vertebral column originally develops as a series of ______ vertebrae, but this number is eventually reduced to _________ vertebrae.

1.	33, 26	2.	31, 24
3.	30, 26	4.	33, 21

68 The first cervical vertebra in humans is known as the

1.	atlas	2.	axis
3.	vertebra prominens	4.	synsacrum

69 Almost all mammals have seven

1.	cervical vertebrae	2.	carpal bones
3.	cranial bones	4.	sacral vertebrae

70 Consider the given statements regarding the human vertebral column:

I:	In adults, it is differentiated into cervical [7], thoracic [12], lumbar [5], sacral [1-fused] and coccygeal [1-fused] regions.
II:	The first vertebra is called as axis and it articulates with the occipital condyles.
III:	The spinal cord runs through a neural canal.
IV:	It protects the spinal cord, supports the head and serves as the point of attachment for the ribs and musculature of the back.

The correct statements include:

1. Only **I**	2. Only **I** and **IV**
3. Only **II** and **III**	4. Only **I, III**, and **IV**

71 Which regions of the adult human vertebral column is formed by fusion of some vertebrae?

1. cervical and thoracic
2. thoracic and lumbar
3. lumbar and sacral
4. sacral and coccygeal

72 Match the number with the corresponding vertebrae:

	Column I		Column II
A.	Cervical	P.	5
B.	Thoracic	Q.	7
C.	Lumbar	R.	12

Codes:

	A	B	C
1.	P	Q	R
2.	Q	P	R
3.	Q	R	P
4.	R	Q	P

73 A flat bone present on the ventral midline of thorax is called as:

1.	Hyoid	2.	Clavicle
3.	Sternum	4.	Vertebral body

74 The total number of vertebrosternal and vertebrochondral ribs in human body respectively are:

1.	7 and 3	2.	14 and 6
3.	3 and 7	4.	6 and 14

75 The ribs in humans:

I:	have two articulation surfaces on its dorsal end and are hence called bicephalic.
II:	connect to the sternum directly or indirectly with the help of hyaline cartilage.

1.	Only **I** is correct	2.	Only **II** is correct
3.	Both **I** and **II** are correct	4.	Both **I** and **II** are incorrect

76 Consider the given two statements:

Assertion (A):	Last 2 pairs (11th and 12th) of ribs are called floating ribs.
Reason (R):	Last 2 pairs (11th and 12th) of ribs are not connected both dorsally and ventrally.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	Both **(A)** and **(R)** are False.

77 Consider the two statements:

Statement I:	First seven pairs of the ribs are called true ribs and are attached to the thoracic vertebrae and ventrally connected to the sternum with the help of elastic cartilage.
Statement II:	The 8th, 9th and 10th pairs are false ribs and join the seventh rib with the help of elastic cartilage.

1. **Statement I** is correct; **Statement II** is correct
2. **Statement I** is correct; **Statement II** is incorrect
3. **Statement I** is incorrect; **Statement II** is correct
4. **Statement I** is incorrect; **Statement II** is incorrect

78 How many of the given statements are correct?

I.	There are 8 cranial bones in human skull.
II.	There are 7 cervical vertebrae in Giraffe.
III.	There are 7 tarsal bones in human ankle.
IV.	There are 8 carpal bones in human wrist.
V.	There are 30 bones in each human limb.
VI.	There are 26 vertebrae in human adults.

1. 3
2. 4
3. 5
4. 6

79 Identify the incorrect statement:

1.	Each limb in humans has 30 bones.
2.	Metacarpals are 8 in number while the metatarsals are 7 in number.
3.	Patella forms the knee cap.
4.	Femur is the longest bone in the human body.

80 The number of correct statement(s) regarding human adult skeleton from the given statements is/are:

I:	Each limb is made of 30 bones.
II:	Carpals are 8 in number
III:	Tarsals are 7 in number
IV:	Metacarpals are 5 in number
V:	Metatarsals are 4 in number

1. 2
2. 3
3. 4
4. 5

81 The total number of phalanges in the human body are:

1.	14	2.	28
3.	56	4.	7

82 The pectoral girdle is composed of

1.	coxa and femur	2.	scapula and humerus
3.	scapula and clavicle	4.	clavicle and sternum

83 The collar bone is the:

1.	Clavicle	2.	Scapula
3.	First rib	4.	Sternum

84 Clavicle:

I:	is a part of the pectoral girdle.
II:	articulates with acromion process of scapula and with sternum
III:	is commonly called the collar bone.

1. Only **I** and **II** are correct
2. Only **I** and **III** are correct
3. Only **II** and **III** are correct
4. **I, II** and **III** are correct

85 A glenoid cavity is:

1.	seen in scapula and articulates with head of humerus
2.	seen in coxal bone and articulates with head of femur
3.	seen in clavicle and articulates with sternum
4.	seen in femur and articulates with patella

86 Which of the following is not correct regarding scapula?

I:	It is situated in the dorsal part of the thorax between the second and the seventh ribs
II:	Clavicle articulates with the acromion process of scapula.

1. Only **I**	2. Only **II**
3. Both **I** and **II**	4. Neither **I** nor **II**

87 Scapula:

I:	is a large triangular flat bone situated in the dorsal part of the thorax between the second and the seventh ribs.
II:	has an expanded process called the acromion.
III:	has glenoid cavity which articulates with the head of the humerus to form the shoulder joint.

1. Only **I** and **II** are correct
2. Only **I** and **III** are correct
3. Only **II** and **III** are correct
4. **I, II** and **III** are correct

88 Each coxal bone is formed by the fusion of three bones which include all the following except:

1.	Ileum	2.	Ischium
3.	Pubis	4.	Ilium

89 The thigh bone articulates the coxal bone at:

1. Obturator foramen
2. Glenoid cavity
3. Acetabulum
4. Olecranon fossa

90 The type of cartilage present in pubic symphysis is:

1.	Elastic	2.	Hyaline
3.	Fibrous	4.	Calcified

JOINTS

91 Force generated by the muscles is used to carry out movement through joints, where the joint acts as a:

1.	Fulcrum	2.	Effort
3.	Resistance	4.	Load

92 The type of joint that will allow least mobility amongst the following would be:

1.	Fibrous joint	2.	Primary cartilaginous joint
3.	Secondary cartilaginous joint	4.	Synovial joint

93 The joint between skull bones is classified as:

1.	cartilaginous	2.	fibrous
3.	epithelial	4.	synovial

94 The fibrous joint between skull bones is called as:

1.	gomphoses	2.	syndesmoses
3.	symphysis	4.	sutures

95 Identify the correct statements:

I:	A synovial joint is a freely moveable joint.
II:	A cartilaginous joint does not allow any movement.
III:	A fibrous joint allows limited movement.

1. Only **I** and **II**
2. Only **II** and **III**
3. Only **I**
4. **I, II** and **III**

96 The joint between the adjacent vertebrae in the vertebral column:

I: is a fibrous joint
II: permits limited movements

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

97 Consider the given two statements:

Assertion(A):	Synovial joints allow considerable movement.
Reason(R):	Synovial joints are characterised by the presence of a fluid filled synovial cavity between the articulating surfaces of the two bones.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
3.	Both **(A)** and **(R)** are False.
4.	**(A)** is True and **(R)** is False.

98 The type of joint seen between the carpal bones is:

1.	Hinge	2.	Pivot
3.	Gliding	4.	Saddle

99 What type of synovial joint is present between atlas and axis bones in human vertebral column?

1. Pivot
2. Condyloid
3. Gliding
4. Saddle

100 The first carpometacarpal joint at the base of the thumb is a:

1.	ellipsoidal joint	2.	pivot joint
3.	saddle joint	4.	gliding joint

101 Which of the following is not a hinge joint in human body?

1. Knee joint
2. Elbow joint
3. Inter-phalangeal joint in hand
4. First caro-metacarpal joint

102 To form the largest ball and socket joint in our body, the head of the femur articulates with the:

1. glenoid cavity
2. acetabulum
3. obturator foramen
4. patella

103 Match type of synovial joint in Column I with correct example in Column II and select the correct answer from the codes given below:

	Column I		**Column II**
A.	Ball and socket	a.	Gleno-humeral joint
B.	Gliding	b.	First carpometacarpal joint
C.	Saddle	c.	Between carpal bones
D.	Condyloid	d.	Metacarpophalangeal joint

Codes

	A	B	C	D
1.	d	c	b	a
2.	d	b	c	a
3.	a	c	b	d
4.	a	b	c	d

104 How many of the given pairs are correctly matched:

I:	Ball and socket joint	Between humerus and pectoral girdle
II:	Hinge joint	Knee joint
III:	Pivot joint	Between atlas and occipital bone
IV:	Gliding joint	Between the carpals
V:	Saddle joint	Between carpal and metacarpal of thumb

1. 2
2. 3
3. 4
4. 5

DISORDERS OF MUSCULAR AND SKELETAL SYSTEM

105 An autoimmune disease resulting in muscle weakness because of abnormal functioning of the neuromuscular junction is:

1.	poliomyelitis	2.	myasthenia gravis
3.	multiple sclerosis	4.	Duchenne muscular dystrophy

106 Consider the given two statements:

Assertion (A):	Myasthenia gravis is characterized by muscle fatigue and weakness.
Reason (R):	It is caused by a hyper response of immune system to a viral infection

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	**(A)** is False but **(R)** is True.

107 Progressive degeneration of skeletal muscle mostly due to genetic disorder is called:

1.	Myasthenia gravis	2.	Muscular dystrophy
3.	Poliomyelitis	4.	Muscle hyperplasia

108 Hypocalcaemia can lead to:

1.	Duchenne Muscular Dystrophy	2.	Tetany
3.	Renal calculi	4.	Myasthenia gravis

109 Tetany is characterised by:

1.	arthritis in multiple joints of the body
2.	wild contractions in muscle due to low Ca^{2+} in body fluid
3.	flaccid paralysis due to high K^+ in body fluid
4.	atrophy of muscle due to prolonged disuse

110 A bone disorder especially seen in post-menopausal women would be:

1.	Rheumatoid arthritis	2.	Rickets
3.	Bone cancer	4.	Osteoporosis

111 Consider the given two statements:

Assertion (A):	The incidence of osteoporosis is higher in post-menopausal women.
Reason (R):	Post-menopausal women have a decreased level of estrogen.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
3.	Both **(A)** and **(R)** are False.
4.	**(A)** is True and **(R)** is False.

112 Accumulation of uric acid in joints will lead to:

1.	Rheumatoid arthritis	2.	Osteoarthritis
3.	Osteomalacia	4.	Gouty arthritis

113 Match each item in Column I with one in Column II and select the correct match from the codes given:

	Column I		**Column II**
A	Myasthenia gravis	P	Auto-immune
B	Arthritis	Q	Inflammation of joints
C	Tetany	R	Low calcium in body fluids
D	Osteoporosis	S	Low levels of oestrogen

Codes:

	A	B	C	D
1.	P	Q	R	S
2.	Q	R	S	P
3.	R	S	P	Q
4.	S	P	Q	R

114 Select the correct statement regarding the specific disorder of muscular or skeletal system.

1.	Muscular dystrophy - age related shortening of muscles
2.	Osteoporosis- decrease in bone mass and higher chances of fractures with advancing age
3.	Myasthenia gravis- auto immune disorder which inhibits sliding of myosin filaments
4.	Gout- inflammation of joints due to extra deposition of calcium

LOCOMOTION AND MOVEMENT - ANSWER KEY

1.	(2)	2.	(4)	3.	(3)	4.	(4)	5.	(4)	6.	(2)	7.	(2)	8.	(2)	9.	(1)	10.	(2)
11.	(3)	12.	(1)	13.	(1)	14.	(4)	15.	(2)	16.	(4)	17.	(3)	18.	(3)	19.	(3)	20.	(4)
21.	(4)	22.	(3)	23.	(2)	24.	(3)	25.	(4)	26.	(4)	27.	(1)	28.	(3)	29.	(2)	30.	(4)
31.	(3)	32.	(2)	33.	(3)	34.	(1)	35.	(1)	36.	(3)	37.	(1)	38.	(1)	39.	(1)	40.	(3)
41.	(3)	42.	(1)	43.	(3)	44.	(3)	45.	(4)	46.	(4)	47.	(3)	48.	(3)	49.	(4)	50.	(3)
51.	(4)	52.	(2)	53.	(2)	54.	(4)	55.	(1)	56.	(1)	57.	(3)	58.	(4)	59.	(4)	60.	(2)
61.	(2)	62.	(1)	63.	(1)	64.	(1)	65.	(2)	66.	(2)	67.	(1)	68.	(1)	69.	(1)	70.	(4)
71.	(4)	72.	(3)	73.	(3)	74.	(2)	75.	(3)	76.	(3)	77.	(4)	78.	(4)	79.	(2)	80.	(3)
81.	(3)	82.	(3)	83.	(1)	84.	(4)	85.	(1)	86.	(4)	87.	(4)	88.	(1)	89.	(3)	90.	(3)
91.	(1)	92.	(1)	93.	(2)	94.	(4)	95.	(3)	96.	(2)	97.	(1)	98.	(3)	99.	(1)	100.	(3)
101.	(4)	102.	(2)	103.	(3)	104.	(3)	105.	(2)	106.	(3)	107.	(2)	108.	(2)	109.	(2)	110.	(4)
111.	(1)	112.	(4)	113.	(1)	114.	(2)												

EXCRETORY PRODUCTS AND THEIR ELIMINATION

INTRODUCTION

1 Urea in humans is synthesized in:

1. Kidneys	2. Renal vein
3. Liver	4. Urinary bladder

2 The most toxic nitrogenous metabolic waste product is:

1. ammonia	2. urea
3. uric acid	4. methane

3 Uricotelic mode of passing out nitrogenous wastes is found in

1. reptiles and bird	2. birds and annelids
3. amphibians and reptiles	4. insects and amphibians

4 Bony fishes are:

1. ureotelic	2. ammonotelic
3. uricotelic	4. Either 1 or 3

5 Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R):

Assertion (A):	Many amphibians excrete mainly ammonia when they are aquatic tadpoles and switch largely to urea excretion when they become land dwelling adults.
Reason (R):	The main disadvantage of urea is its energy cost and the main advantage is its low toxicity.

In the light of the above statements choose the correct answer from the options given below

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	Both **(A)** and **(R)** are False.

6 All the following animals are uricotelic except:

1. Reptiles	2. Land snails
3. Birds	4. Marine fishes

7 Protonephridia are the excretory structures in all the following except:

1. *Planaria*	2. Rotifers
3. *Amphioxus*	4. Prawns

8 Match each item in Column I with one in Column II and select the correct match from the codes given:

	Column I [Organism]		**Column II [Osmoregulatory and excretory structure]**
A	Flatworms, rotifers, *Amphioxus*	P	Protonephridia
B	Earthworm	Q	Nephridia
C	Insects	R	Malpighian tubule
D	Prawn	S	Green gland or antennal gland

Codes:

	A	B	C	D
1.	P	Q	R	S
2.	Q	R	S	P
3.	R	S	P	Q
4.	S	P	Q	R

9 Identify the correct statements:

I:	Cartilaginous fishes are ammonotelic.
II:	Mammals are ureotelic.
III:	Land snails are uricotelic.

1. Only **I** and **II**
2. Only **I** and **III**
3. Only **II** and **III**
4. **I, II** and **III**

10 A combination of flame cell and a tube cell, a protonephridium, is the osmoregulatory and excretory structure in:

1.	Platyhelminthes	2.	Annelids
3.	Aschelminthes	4.	Echinoderms

11 Match each item in Column I with one in Column II and select the correct match from the codes given:

	Column I		Column II
A.	Ammonotelism	P.	Terrestrial amphibians
B.	Ureotelism	Q.	Aquatic amphibians
C.	Uricotelism	R.	Land snails

Codes:

	A	B	C
1.	P	Q	R
2.	Q	P	R
3.	R	Q	P
4.	Q	R	P

12 Consider the given two statements:

Assertion (A):	Terrestrial adaptation in animals necessitated the production of lesser toxic nitrogenous metabolic wastes.
Reason (R):	Terrestrial animals must conserve water.

1.	**(A)** is True but **(R)** is False.
2.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
3.	**(A)** is False but **(R)** is True.
4.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.

13 How many of the given statements are correct?

I:	Protonephridia are primarily concerned with ionic and fluid volume regulation, i.e., osmoregulation.
II:	Nephridia are the tubular excretory structures of earthworms and other annelids.
III:	Malpighian tubules are the excretory structures of most of the insects including cockroaches.
IV:	Antennal glands or green glands perform the excretory function in crustaceans like prawns.

1. 1
2. 2
3. 3
4. 4

14

Assertion(A):	Urea can be used to maintain osmolarity of body fluids.
Reason(R):	Urea is more toxic and energetically less expensive than ammonia.

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	**(A)** is False and **(R)** is True.

15 Match the following excretory organs with the correct animal:

	Column I		Column II
A	Kidneys	P	Humans
B	Malpighian tubules	Q	Birds
C	Green glands	R	Crabs
D	Cloaca	S	Insects

Codes:

	A	B	C	D
1.	P	R	S	Q
2.	R	P	Q	S
3.	P	S	R	Q
4.	S	P	Q	R

16 Consider the given two statements:

Assertion (A):	Ammonia is considered to be a less toxic excretory product compared to urea and uric acid.
Reason (R):	Ammonia requires a large amount of water for its elimination due to its high solubility and toxic nature.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	Both **(A)** and **(R)** are True and **(R)** does not correctly explain **(A)**.
3.	**(A)** is True, **(R)** is False.
4.	**(A)** is False, **(R)** is True.

17 Which nitrogenous waste has the highest solubility in water?

1.	Urea	2.	Uric acid
3.	Ammonia	4.	Creatinine

18 Consider the given two statements:

Assertion (A):	Urea is the primary nitrogenous waste in humans.
Reason (R):	It is less toxic and more soluble in water compared to ammonia.

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	**(A)** is False but **(R)** is True.

19 Consider the given two statements:

Assertion (A):	Being uricotelic is more advantageous than being ammonotelic.
Reason (R):	Uric acid is less toxic and requires less water for excretion compared to ammonia.

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	**(A)** is False but **(R)** is True.

20 Which one of the following option gives the correct categorization of six animals according to the type of nitrogenous wastes (A, B, C), they give out ?

	A	B	C
	Ammonotelic	Ureotelic	Uricotelic
1.	Aquatic Amphibia	Frogs, Humans	Pigeon, Lizards, Cockroach
2.	Aquatic Amphibia	Cockroach, Humans	Frog, Pigeon, Lizards
3.	Pigeon, Humans	Aquatic Amphibia, Lizards	Cockroach, Frog
4.	Frog, Lizards	Aquatic Amphibia, Humans	Cockroach, Pigeon

21 The principal nitrogenous excretory compound in humans is synthesised

1. in kidneys but eliminated mostly through liver
2. in kidneys as well as eliminated by kidneys
3. in liver and also eliminated by the same through bile
4. in the liver, but eliminated mostly through kidneys

HUMAN EXCRETORY SYSTEM

22 The location of kidneys in humans can be best described as:

1.	between last thoracic and third lumbar vertebra close to dorsal inner wall of abdominal cavity
2.	between last thoracic and third lumbar vertebra close to ventral inner wall of abdominal cavity
3.	between 10th thoracic and third lumbar vertebra close to dorsal inner wall of abdominal cavity
4.	between 10th thoracic and third lumbar vertebra close to ventral inner wall of abdominal cavity

23 How many of the given vital stats regarding human kidneys are within normal range of their values?

A. Length: 10-12 cm
B. Width: 5-7 cm
C. Thickness: 2-3 cm
D. Weight: 120-170 g

1. 1
2. 2
3. 3
4. 4

24 Consider the given two statements:

I:	The right kidney is located slightly lower than the left kidney.
II:	The average weight of human kidney varies between 120 g and 170 g.

1. Only **I** is correct
2. Only **II** is correct
3. Neither **I** nor **II** are correct
4. Both **I** and **II** are correct

25 Beginning from the collecting duct, arrange the following structures in the correct sequence in which urine passes to the external environment: (A) ureter, (B) renal pelvis, (C) calyx, (D) urinary bladder, (E) urethra.

1. A, B, C, D, E	2. C, D, A, E, B
3. C, B, A, D, E	4. B, D, A, C, E

26 Recessed central fissure on the medial surface of the kidney where its vessels, nerves and ureter pass is called as:

1.	hilum	2.	renal sinus
3.	renal calyces	4.	adrenal glands

27 Ureters:

1.	transport urine to the urethra
2.	transport urine from the renal pelvis to the urinary bladder
3.	collect urine directly from collecting ducts
4.	are lined with squamous epithelium

28 In the male, urethra serves to:

1. transport urine from kidney to bladder
2. transport sperms to ejaculatory ducts
3. store urine and sperms
4. discharge semen and urine

29 Urine from the major calyces in the kidney is collected by:

1.	minor calyces	2.	renal pelvis
3.	ureters	4.	renal papillae

30 Identify the incorrectly matched pair:

1.	Renal hilum	the entry and exit site for structures servicing the kidneys: vessels, nerves, lymphatics, and ureters.
2.	Columns of Bertini	Extension of renal medulla into renal cortex
3.	Renal pelvis	The funnel-like dilated part of the ureter in the kidney
4.	Renal capsule	A tough fibrous layer surrounding the kidney

31 The renal cortex:

1. is in contact with the outer capsule
2. is divided into eight to fifteen conical renal pyramids
3. drains into the minor calyces
4. has long loop of Henle of juxtamedullay nephrons

32 10 to 15 distinct conical or triangular structures in the human kidney are seen in renal ______ and are known as renal ______.

1.	pelvis; calyces	2.	medulla; pyramids
3.	cortex; columns of Bertini	4.	cortex; lobes

33 Urine in ureter is drained directly from:

1.	Collecting duct	2.	Papilla
3.	Renal pelvis	4.	Major calyces

34 The functional unit of the human kidney is the:

1.	glomerulus	2.	Malpighian body
3.	nephron	4.	medullary pyramids

35 The branch of renal artery that directly supplies the glomerulus is the:

1.	efferent arteriole	2.	interlobular artery
3.	arcuate artery	4.	afferent arteriole

36 Malpighian body or the renal corpuscle is made up of:

1. Glomerular capillaries and PTCN
2. Bowman's capsule and renal tubules
3. Afferent and efferent arterioles
4. Glomerular capillaries and Bowman's capsule

37 Identify the correct statements:

I:	Each kidney of an adult human measures 10-12 cm in length, 5-7 cm in width and 2-3 cm in thickness.
II:	The DCTs of many nephrons open into a straight tube called collecting duct.
III:	Each nephron has two parts – the glomerulus and the renal tubule.
IV:	The renal tubule begins with the proximal convoluted tubule.

1.	Only **I** and **II**	2.	Only **I, II** and **III**
3.	Only **II** and **III**	4.	**I, II, III** and **IV**

38 Consider the two statements regarding the structure of nephron in human kidneys:

Statement I:	Glomerulus along with Bowman's capsule, is called the malpighian body or renal corpuscle.
Statement II:	The DCTs of many nephrons open into a straight tube called collecting duct.

1. **Statement I** is correct: **Statement II** is incorrect
2. **Statement I** is incorrect: **Statement II** is correct
3. **Statement I** is correct: **Statement II** is correct
4. **Statement I** is incorrect: **Statement II** is incorrect

39 Vasa recta:

I:	is a fine capillary network around the renal tubule formed by efferent arteriole.
II:	runs parallel to the Henle's loop in juxtamedullary nephrons.
III:	is absent or highly reduced in cortical nephrons.

1. Only **I** is correct
2. Only **II** and **III** are correct
3. Only **III** is correct
4. **I, II** and **III** are correct

40 Blood from the glomerulus is carried away by:

1. Vasa recta
2. Peritubular capillary network
3. Efferent arteriole
4. Afferent arteriole

41 Identify the correct statements regarding nephrons in human kidney:

I:	There are nearly one million nephrons in each kidney.
II:	The Malpighian corpuscle, PCT and DCT of the nephron are located in the renal medulla.

1. Only **I**
2. Only **II**
3. Both **I** and **II**
4. Neither **I** nor **II**

42 Cortical nephrons differ from juxtamedullary nephrons in that:

1.	Cortical nephrons are primarily involved in the filtration of blood.
2.	Juxtamedullary nephrons have a longer loop of Henle that extends deep into the medulla.
3.	Cortical nephrons are absent in mammals.
4.	Juxtamedullary nephrons are not involved in the concentration of urine.

43 Consider the given two statements:

Assertion (A):	Juxtamedullary nephrons play very important role in concentration of urine.
Reason (R):	Juxtamedullary nephrons constitute about 85% of all nephrons in human kidneys.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**
2.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**
3.	**(A)** is True but **(R)** is False
4.	**(A)** is False but **(R)** is True

44 Consider the given two statements:

A:	Glomerulus is a tuft of capillaries formed by the afferent arteriole.
B:	Vasa recta is absent or highly reduced in cortical nephrons.

1. Only **A** is correct.
2. Only **B** is correct.
3. Both **A** and **B** are correct.
4. Both **A** and **B** are incorrect.

45 In majority of the nephrons in the human kidney,

A:	The loop of Henle is short and extends only very little into the medulla.
B:	Vasa recta is absent or highly reduced.

1. Only **A** is correct.
2. Only **B** is correct.
3. Both **A** and **B** are correct.
4. Both **A** and **B** are incorrect.

46 Consider the given two statements:

Assertion (A):	Juxtamedullary nephrons are crucial for the process of urine concentration.
Reason (R):	They have longer loops of Henle, which extend deep into the medulla, allowing more effective water reabsorption.

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	Both **(A)** and **(R)** are False.

47 Identify the correct chronological sequence of the flow of the glomerular filtrate and urine from the given options:

1.	glomerulus-glomerular capsule-proximal tubules-loop of Henle-distal tubules-collecting duct-renal pelvis
2.	glomerular capsule -glomerulus-loop of Henle-distal tubules-proximal tubules-distal tubular-collecting duct-renal pelvis
3.	loop of Henle-distal tubules-collecting duct-proximal tubules-glomerulus-glomerular capsule-renal pelvis
4.	loop of Henle-collecting duct -distal tubules-proximal tubules-glomerulus-glomerular capsule-renal pelvis

48 Juxtamedullary nephrons:

I:	have a long loop of Henle which penetrates deeply into the renal medulla
II:	have their loop of Henle surrounded by the vasa recta
III:	comprise only about 15% of the nephrons in the human kidney

1. Only **I** and **II** are correct
2. Only **I** and **III** are correct
3. Only **II** and **III** are correct
4. **I, II** and **III** are correct

49 In majority of the nephrons, the loop of Henle:

1. is absent
2. extends only a little into the medulla
3. extends deep into the medulla
4. is associated with a highly developed vasa recta

URINE FORMATION

50 Consider the two statements:

I:	The process of filtration at Malpighian body is regarded as ultrafiltration.
II:	Blood is filtered so finely that all constituents of plasma pass into the lumen of Bowman's capsule.

1.	Both **I** and **II** are correct and **II** explains **I**
2.	Both **I** and **II** are correct but **II** does not explain **I**
3.	**I** is correct but **II** is incorrect
4.	**I** is incorrect but **II** is correct

51 Where do you expect to find podocytes?

1. In the wall of afferent arteriole
2. In the wall of the DCT
3. In the lining of Bowman's capsule
4. In the lining of Vasa recta

52 The reabsorption, from the filtrate, of sodium, glucose and amino acids:

1. involves the Bowman's capsule
2. is restricted to the loop of Henle
3. occurs mainly in the proximal convoluted tubules
4. occurs mainly by osmosis

53 The vascular endothelium of glomerular capillaries, basement membrane, and podocytes in the inner lining of Bowman's capsule form:

1. filtration membrane	2. juxtaglomerular apparatus
3. Malpighian corpuscle	4. nephron

54 About what percent of the glomerular ultrafiltrate is reabsorbed by the tubules during urine formation?

1. 99%	2. 70%
3. 50%	4. 20%

55 JGA is a special sensitive region formed by cellular modifications in the:

1.	DCT and the afferent arteriole at the location of their contact
2.	DCT and the efferent arteriole at the location of their contact
3.	PCT and the afferent arteriole at the location of their contact
4.	PCT and the efferent arteriole at the location of their contact

56 Identify the incorrectly matched pair [assume normal physiological conditions]:

1.	GFR – 125 ml/min
2.	Amount of urea produced – 25 to 30 mg/day
3.	Average urine output – 1 to 1.5 liter/day
4.	Average amount of blood filtered by kidney – 1100 to 1200 ml/min

57 A person has a cardiac output of 6000 ml per minute and 20% of this is received by kidneys. What is the renal plasma flow per minute?

1. 1200 ml	2. 660 ml
3. 400 ml	5. 120 ml

58 Glomerular ultrafiltrate normally does not contain:

1. formed elements of the blood	2. glucose
3. amino acids	4. electrolytes

59 Renin is secreted by:

1. the macula densa of the DCT
2. the JG cells of the afferent arteriole
3. podocytes of Bowman's capsule
4. hepatocytes

60 The glomerular filtrate, under normal physiological conditions, should not contain any:

1.	Sodium	2.	Urea
3.	Proteins	4.	Glucose

61 The glomerular filtration rate:

I:	is the volume of plasma that is filtered by the glomeruli per unit of time.
II:	is estimated to be about 125 ml/day.

1. Only **I** is correct
2. Only **II** is correct
3. Neither **I** nor **II** are correct
4. Both **I** and **II** are correct

62 Consider the given two statements:

Assertion (A):	Glomerular filtration is considered as a process of ultra-filtration.
Reason (R):	The glomerular capillary blood pressure causes filtration through three layers.

1.	**(A)** is True but **(R)** is False.
2.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
3.	**(A)** is False but **(R)** is True.
4.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.

63 Urine formation involves three main processes, including all of the following, except:

1. Glomerular filtration
2. Reabsorption
3. Tubular secretion
4. Synthesis of urea by JG cells

64 Consider the given two statements:

Assertion (A):	Tubular secretion helps in the maintenance of ionic and acid-base balance of body fluids.
Reason (R):	During urine formation, the tubular cells secrete substances like H^+, K^+ and ammonia into the filtrate.

1. **(A)** is True but **(R)** is False.
2. Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
3. **(A)** is False but **(R)** is True.
4. Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.

65 Consider the two statements:

Statement I:	JGA is a special sensitive region formed by cellular modifications in the proximal convoluted tubule and the efferent arteriole at the location of their contact.
Statement II:	A fall in GFR can activate the JG cells to release renin which can stimulate the glomerular blood flow and thereby the GFR back to normal.

1. **Statement I** is correct; **Statement II** is incorrect
2. **Statement I** is incorrect; **Statement II** is correct
3. **Statement I** is correct; **Statement II** is correct
4. **Statement I** is incorrect; **Statement II** is incorrect

66 The epithelial cells of Bowman's capsule, arranged in an intricate manner so as to leave some minute spaces called filtration slits or slit pores, are called as:

1.	Macula densa	2.	Juxtaglomerular cells
3.	Podocytes	4.	Mesangial cells

67 A comparison of the volume of the filtrate formed per day with that of the urine released suggests that nearly:

1. 20% of the cardiac output is received by the kidneys.
2. 20% of the renal plasma flow is filtered at the glomerulus.
3. 99% of the filtrate has to be reabsorbed by the renal tubules.
4. 3% of the filtrate gets converted into urine.

FUNCTION OF THE TUBULES

68 What type of epithelium lines the proximal convoluted tubules of a human nephron?

1. Simple squamous
2. Simple cuboidal brush bordered
3. Simple columnar brush bordered
4. Simple columnar ciliated

69 Consider the given two statements:

Assertion (A):	It is important that the proximal convoluted tubule of the nephron is lined with simple cuboidal brush bordered epithelium.
Reason (R):	Maximum reabsorption from the ultrafiltrate takes place in this segment of the nephron.

1. Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2. Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
3. **(A)** is True; **(R)** is False.
4. Both **(R)** and **(R)** are False.

70 Identify the incorrect statement regarding proximal convoluted tubule:

1. It is lined by simple cuboidal brush bordered epithelium
2. It reabsorbs 70-80 % of electrolytes and water and nearly all nutrients
3. In juxta-medullary nephrons, it extends deep into the renal medulla
4. It secretes hydrogen ions, ammonia and reabsorbs bicarbonate ions to maintain the ionic and pH balance of the body fluids

71 Identify the incorrect statement:

1.	The descending limb of loop of Henle is permeable to water but almost impermeable to electrolytes.
2.	The ascending limb of loop of Henle is impermeable to water but allows transport of electrolytes actively or passively.
3.	DCT is capable of reabsorption of bicarbonate ions and selective secretion of hydrogen and potassium ions and ammonia to maintain the pH and electrolyte balance in the body.
4.	PCT does not play any role in reabsorption of bicarbonate ions and selective secretion of hydrogen and ammonia to maintain the pH and electrolyte balance in the body.

72 Consider the given two statements:

Assertion (A):	As the filtrate moves down the descending limb of Loop of Henle, it gets concentrated.
Reason (R):	The descending limb of loop of Henle is permeable to water but almost impermeable to electrolytes.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains the **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain the **(A)**.
3.	**(A)** is True; **(R)** is False.
4.	Both **(A)** and **(R)** are False.

73 During the movement of the glomerular ultrafiltrate through the descending limb of the loop of Henle:

I: water moves into the nephron

II: solutes move out of the nephron

III: water moves out of the nephron

1. Only **I**
2. Only **II** and **III**
3. Only **III**
4. Only **I** and **II**

74 Identify the correct statements regarding the absorptive capabilities of the limbs of loop of Henle in human kidneys:

I:	Descending limb is impermeable to water.
II:	Ascending limb is impermeable to electrolytes.

1. Only **I**
2. Only **II**
3. Both **I** and **II**
4. Neither **I** nor **II**

75 Where, within the loop of Henle, do you expect that the fluid will be most concentrated?

1. In the ascending limb
2. In the descending limb
3. At the hairpin bend
4. Just when it is joining the distal convoluted tubule

76 The part of the nephron that is least permeable to water is the:

1. ascending limb of the loop of Henle
2. descending limb of the loop of Henle
3. collecting duct
4. proximal convoluted tubule

77 Conditional absorption of water takes place mainly in:

1. PCT	2. Loop of Henle
3. DCT	4. Collecting duct

78 Match the parts of the nephron in Column I with function/feature in Column II and select the answer from the codes given:

	Column I		**Column II**
A.	PCT	a.	Maximum reabsorption of water and electrolytes
B.	Loop of Henle - descending limb	b.	Permeable to water but almost impermeable to electrolytes
C.	Loop of Henle - ascending limb	c.	Impermeable to water but permeable to electrolytes
D.	DCT	d.	Conditional reabsorption of Na^+ and water

Codes

	A	B	C	D
1.	a	b	c	d
2.	b	a	d	c
3.	a	b	d	c
4.	b	a	d	c

79 Collecting duct does not:

I:	allow reabsorption of large amount of water during concentration of urine.
II:	allow passage of small amounts of urea into medullary interstitium to keep up the osmolarity.
III:	play a role in the maintenance of pH and ionic balance of blood by the selective secretion of H^+ and K^+ ions.

1.	Only **I** and **II**	2.	Only **III**
3.	Only **II**	4.	**I**, **II** and **III** are incorrect

80 Potassium ions:

I:	are filtered at the glomerulus
II:	are reabsorbed at the PCT
III:	are secreted at DCT

Correct statements are:

1. **I** & **II** only
2. **I** & **III** only
3. **II** & **III** only
4. **I**, **II** & **III**

81 What would be true about the role of collecting duct in the concentration of urine by the kidneys?

I:	Allows passage of small amounts of urea into the medullary interstitium
II:	Large amounts of water could be reabsorbed from this part to produce a concentrated urine.

1.	Only **I**	2.	Only **II**
3.	Both **I** and **II**	4.	Neither **I** nor **II**

MECHANISM OF CONCENTRATION OF FILTRATE

82 A counter current mechanism for concentration of urine exists between:

1.	Ascending limb of vasa recta and ascending limb of loop of Henle
2.	Descending limb of vasa recta and descending limb of loop of Henle
3.	Collecting duct and ascending limb of loop of Henle
4.	Collecting duct and descending limb of loop of Henle

83 Identify the correct statements:

I:	The flow of filtrate in the two limbs of Henle's loop is in opposite directions and thus forms a counter current.
II:	The flow of blood through the two limbs of vasa recta is also in a counter current pattern.
III:	Although there is proximity between the Henle's loop and vasa recta, yet they do not form a counter current.

1. Only **I** and **II**
2. Only **I** and **III**
3. Only **II** and **III**
4. **I**, **II** and **III**

84 The average osmolality of most of the body fluids in the human body under normal physiological condition is about:

1. 300 $mOsmolL^{-1}$
2. 600 $mOsmolL^{-1}$
3. 900 $mOsmolL^{-1}$
4. 1200 $mOsmolL^{-1}$

85 Consider the given two statements regarding the mechanism of increasing medullary interstitium osmolarity when kidney is trying to produce concentrated urine:

Statement I:	NaCl is transported by the ascending limb of Henle's loop which is exchanged with the descending limb of vasa recta.
Statement II:	NaCl is returned to the interstitium by the ascending portion of vasa recta.

1. **Statement I** is correct: **Statement II** is incorrect
2. **Statement I** is incorrect: **Statement II** is correct
3. **Statement I** is correct: **Statement II** is correct
4. **Statement I** is incorrect: **Statement II** is incorrect

86 During concentration of urine, NaCl is returned to medullary interstitium by:
1. Ascending limb of Loop of Henle
2. Descending limb of Loop of Henle
3. Ascending limb of Vasa Recta
4. Descending limb of Vasa Recta

87 During the counter current mechanism, small amount of urea from interstitium enters:
1. the collecting duct
2. the thin segment of ascending limb of loop of Henle
3. the ascending limb of vasa recta
4. the descending limb of vasa recta

88 During the concentration of urine, the medullary interstitial osmolality is increased by all the following except:

1.	Solute reabsorption in the ascending limb of the loop of Henle
2.	Sodium reabsorption in the distal tubule
3.	Urea reabsorption from the proximal tubule
4.	Urea recycling between the loop of Henle and the collecting duct

89 The osmolarity of interstitial fluid in renal cortex of vertebrates is about _____ mOsm per litre, which can be increased to about _______ mOsm per litre in the inner medulla during concentration of urine by the kidneys.

1.	1200, 300	2.	300, 1200
3.	300, 600	4.	600, 300

90 The increasing gradient of osmolarity in medullary interstitium, during concentration of urine, is mainly caused by reabsortion of:

1.	NaCl from ascending limb of loop of Henle and of urea by collecting duct
2.	NaCl from descending limb of loop of Henle and of urea by collecting duct
3.	NaCl from ascending limb of loop of Henle and of urea by PCT
4.	NaCl from descending limb of loop of Henle and of urea by PCT

91 The region of human kidney where you expect to find maximum osmolarity is:
1. at the top of the renal cortex
2. at the bottom of the renal cortex
3. at the top of the renal medulla
4. at the bottom of the renal medulla

92 The human kidneys can produce urine concentrated nearly:
1. two times than the initial filtrate formed.
2. four times than the initial filtrate formed.
3. six times than the initial filtrate formed.
4. eight times than the initial filtrate formed.

Regulation of Kidney Function

93 An excessive loss of body fluid can:

1.	activate osmoreceptors, stimulating hypothalamus to release ADH and thereby preventing diuresis
2.	switch off osmoreceptors, suppressing release of ADH promoting diuresis
3.	activate osmoreceptors, stimulating hypothalamus to release ADH and thereby promoting diuresis
4.	switch off osmoreceptors, suppressing release of ADH preventing diuresis

94 Identify the incorrect statement regarding antidiuretic hormone (ADH):

1.	It is synthesized by the neurons of the hypothalamus and stored and released from the neurohypophysis.
2.	It binds to receptors on the collecting duct cells and activates a cAMP second messenger system.
3.	It is released during body dehydration conditions and acts on the collecting duct.
4.	ADH is released when osmoreceptors in the hypothalamus sense a decrease in the blood osmolality.

95 Identify the correct statement regarding human kidney function if ADH is not secreted in the body:

1.	Urine will be isoosmotic with plasma.
2.	PCT will not be able to reabsorb water and sodium.
3.	The collecting ducts have very low permeability to water.
4.	The distal tubules secrete water.

96 The collecting ducts become permeable to water and urea due to:

1. Aldosterone	2. Atrial natriuretic peptide
3. Renin	4. ADH (vasopressin)

97 ADH:

I:	facilitates water reabsorption from latter parts of the tubule, thereby preventing diuresis.
II:	is a potent vasodilator.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

98 Consider the given two statements:

Assertion (A):	ADH prevents diuresis.
Reason (R):	ADH facilitates water reabsorption from the latter parts of the tubule.

1.	**(A)** is True but **(R)** is False.
2.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
3.	**(A)** is False but **(R)** is True.
4.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.

99 Which area actually secretes renin into the blood?

1. macula densa	2. juxtaglomerular apparatus
3. juxtaglomerular cells	4. cortical nephron

100 JG cells can be activated to release renin by all the following except:

1. A fall in glomerular blood flow
2. A fall in glomerular blood pressure
3. An increase in venous return to the heart
4. A fall in GFR

101 Consider the given two statements:

Statement I:	An increase in blood flow to the atria of the heart can cause the release of Atrial Natriuretic Factor (ANF).
Statement II:	A fall in glomerular blood flow/glomerular blood pressure/GFR can activate the JG cells to release renin.

1.	**Statement I is correct; Statement II is incorrect**
2.	**Statement I is correct; Statement II is correct**
3.	**Statement I is incorrect; Statement II is incorrect**
4.	**Statement I is incorrect; Statement II is correct**

102 A hormone formed in the blood that causes vasoconstriction is:

1. Renin	2. Aldosterone
3. Angiotensin	4. Vasopressin

103 The hormone produced by the adrenal cortex, when stimulated by angiotensin II, that causes increased sodium and water reabsorption in the distal convoluted tubules, is:

1. renin	2. aldosterone
3. antidiuretic hormone	4. cortisol

104 What acts as a check on the renin-angiotensin mechanism?

1.	ANF	2.	ADH
3.	Aldosterone	4.	Erythropoietin

105 Consider the given two statements:

Assertion (A):	Atrial Natriuretic Factor (ANF) mechanism acts as a check on the renin-angiotensin mechanism.
Reason (R):	An increase in blood flow to the atria of the heart can cause the release of ANF.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
3.	**(A)** is True; **(R)** is False.
4.	Both **(A)** and **(R)** are False.

106 What physiological change is brought about by the Renin Angiotensin Aldosterone System in the end?

1. a reduced blood volume
2. an increased blood glucose level
3. a reduced blood pressure
4. an increased blood pressure

107 The main function of aldosterone in Renin-Angiotensin mechanism is:

1.	It converts angiotensinogen in blood to angiotensin I.
2.	It is a powerful vasodilator.
3.	It causes reabsorption of Na^+ and water from the distal parts of the tubule.
4.	It activate the JG cells to release rennin.

108 Angiotensin II:

I: causes increased aldosterone secretion.
II: causes vasodilation.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

109 How does Atrial Natriuretic Factor (ANF) oppose the Renin-Angiotensin-Aldosterone System (RAAS)?

1.	ANF increases blood pressure and blood volume.
2.	ANF causes vasodilation leading to decrease in blood pressure.
3.	ANF increases the reabsorption of sodium in the distal convoluted tubule.
4.	ANF promotes the secretion of renin from the kidneys.

110 Which of the following are vasoconstrictors?

A: Antidiuretic hormone
B: Angiotensin II
C: Atrial natriuretic factor

1. Only **A** and **B**
2. Only **B**
3. Only **A** and **C**
4. **A, B** and **C**

MICTURITION

111 Urination will be caused by simultaneous:

1.	contraction of smooth muscle of bladder and relaxation of urethral sphincter
2.	relaxation of smooth muscle of bladder and contraction of urethral sphincter
3.	contraction of smooth muscle of bladder and urethral sphincter
4.	relaxation of smooth muscle of bladder and urethral sphincter

112 The presence of which of the following in urine would be abnormal?

1. sodium	2. glucose
3. urea	4. creatinine

113 Presence of ketonuria and glycosuria is indicative of:

1. Renal failure	2. Diabetes mellitus
3. Nephrotic syndrome	4. Renal stones

114 Identify the incorrect statement:

1.	An adult human excretes, on an average, 1 to 1.5 litres of urine per day.
2.	The urine formed is slightly basic (pH-7.5).
3.	On an average, 25-30 gm of urea is excreted out per day.
4.	Presence of glucose (Glycosuria) and ketone bodies (Ketonuria) in urine are indicative of diabetes mellitus.

115 Identify the incorrect statement regarding micturition reflex?

1.	Signal for the reflex is initiated by the stretching of the urinary bladder as it gets filled with urine.
2.	The stretch receptors on the walls of the bladder send signals to the CNS.
3.	The CNS passes on motor messages leading to the relaxation of smooth muscles of the bladder.
4.	There is simultaneous relaxation of the urethral sphincter causing the release of urine.

116 The average pH of human urine is approximately:

1. 8
2. 7
3. 6
4. 7.5

117 Which of the following is true for excretion in humans?

1.	Glucose and amino acids are reabsorbed in PCT by simple diffusion.
2.	DCT is impermeable to water.
3.	On an average, 25-30 gm of urea is excreted out per day.
4.	Maximum reabsorption occurs in the loop of Henle.

ROLE OF OTHER ORGANS IN EXCRETION

118 Removal rate of carbon dioxide by lungs is approximately:

1.	125 ml/minute	2.	200 ml/minute
3.	280 ml/minute	4.	325 ml/minute

119 Sterols, hydrocarbons and waxes can be eliminated through:

1.	Saliva	2.	Sweat
3.	Sebum	4.	Tears

120 Regarding role of organs other than kidneys in excretion:

I:	Our lungs remove approximately 200mL/minute of CO_2
II:	Liver secretes bile-containing substances like bilirubin, biliverdin, cholesterol, degraded steroid hormones, vitamins and drugs.
III:	Sweat produced by the sweat glands is a watery fluid containing NaCl, small amounts of urea, lactic acid, etc.
IV:	Sebaceous glands eliminate certain substances like sterols, hydrocarbons and waxes through sebum.

1. Only **I, II** and **III** are correct
2. Only **I, III** and **IV** are correct
3. Only **II, III** and **IV** are correct
4. **I, II, III** and **IV** are correct

121 Identify the incorrect statement:

1.	Lungs remove large amount of carbon dioxide.
2.	Sweat contains sodium chloride, small amount of urea and lactic acid.
3.	Sebaceous glands eliminate sterols, hydrocarbons, and waxes.
4.	Saliva does not eliminate any nitrogenous waste

122 The role of other organs in excretion includes the skin, which:

1. Excretes excess water and salts.
2. Produces bile to aid in digestion.
3. Filters blood to remove urea.
4. Secretes hormones to regulate blood pressure.

DISORDER OF EXCRETORY SYSTEM

123 Uremia patients can have all the following except:

1. Increased blood glucose between meals
2. Anemia
3. Osteomalacia
4. An acidic blood pH

124 The dialyzing fluid has same composition as that of plasma except:

1.	Nitrogenous wastes	2.	Bicarbonate
3.	Sodium	4.	Chloride

125 In hemodialysis, the role of artificial kidney is actually played by:

1.	Dialysate	2.	Blood pump
3.	Water system	4.	Cellulose membrane

126 During hemodialysis:

I:	Cellophane tube in a dialysing unit acts as artificial kidney.
II:	Heparin is added to the blood before it is passed on to the dialysing unit.
III:	The cleared blood is pumped back to the body through a vein after adding anti-heparin to it.

1. Only **I** is correct
2. Only **I** and **II** are correct
3. Only **II** and **III** are correct
4. **I, II** and **III** are correct

127 In humans, urea is produced in the:

1. liver and eliminated by the kidneys
2. kidneys and eliminated by the kidneys
3. liver and eliminated by the intestines
4. intestines and eliminated by the kidneys

128 The presence of which of the following on a routine urine analysis test will not be considered as normal?

1. sodium
2. glucose
3. urea
4. creatinine

129

Assertion(A):	In hemodialysis, heparin is added to the blood taken out of the body for purification.
Reason(R):	Heparin is an anti-coagulant.

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	**(A)** is False and **(R)** is True.

130 What is the working principle of hemodialysis?

1.	It uses active transport to remove waste products from the blood.
2.	It uses a selectively permeable membrane to remove waste products from the blood by diffusion.
3.	It directly removes waste from the kidneys.
4.	It recycles red blood cells and plasma.

131 Most renal calculi are:

1.	oxalates	2.	citrates
3.	urates	4.	carbonates

EXCRETORY PRODUCTS AND THEIR ELIMINATION - ANSWER KEY

1.	(3)	2.	(1)	3.	(1)	4.	(2)	5.	(1)	6.	(4)	7.	(4)	8.	(1)	9.	(3)	10.	(1)
11.	(2)	12.	(2)	13.	(4)	14.	(3)	15.	(3)	16.	(4)	17.	(3)	18.	(3)	19.	(1)	20.	(1)
21.	(4)	22.	(1)	23.	(4)	24.	(4)	25.	(3)	26.	(1)	27.	(2)	28.	(4)	29.	(2)	30.	(2)
31.	(1)	32.	(2)	33.	(3)	34.	(3)	35.	(4)	36.	(4)	37.	(2)	38.	(3)	39.	(2)	40.	(3)
41.	(1)	42.	(2)	43.	(3)	44.	(3)	45.	(3)	46.	(1)	47.	(1)	48.	(4)	49.	(2)	50.	(3)
51.	(3)	52.	(3)	53.	(1)	54.	(1)	55.	(1)	56.	(2)	57.	(2)	58.	(1)	59.	(2)	60.	(3)
61.	(1)	62.	(4)	63.	(4)	64.	(2)	65.	(2)	66.	(3)	67.	(3)	68.	(2)	69.	(1)	70.	(3)
71.	(4)	72.	(1)	73.	(3)	74.	(4)	75.	(3)	76.	(1)	77.	(3)	78.	(1)	79.	(4)	80.	(4)
81.	(3)	82.	(3)	83.	(1)	84.	(1)	85.	(3)	86.	(3)	87.	(2)	88.	(3)	89.	(2)	90.	(1)
91.	(4)	92.	(2)	93.	(1)	94.	(4)	95.	(3)	96.	(4)	97.	(1)	98.	(2)	99.	(3)	100.	(3)
101.	(2)	102.	(3)	103.	(2)	104.	(1)	105.	(2)	106.	(4)	107.	(3)	108.	(1)	109.	(2)	110.	(1)
111.	(1)	112.	(2)	113.	(2)	114.	(2)	115.	(3)	116.	(3)	117.	(3)	118.	(2)	119.	(3)	120.	(4)
121.	(4)	122.	(1)	123.	(1)	124.	(1)	125.	(4)	126.	(4)	127.	(1)	128.	(2)	129.	(1)	130.	(2)
131.	(1)																		

NEURAL SYSTEM

1 A nerve-net, a network of neurons, makes up the neural organization in:

1. Sponges	2. *Hydra*
3. *Planaria*	4. Earthworm

HUMAN NEURAL SYSTEM

2 Match each item in Column I with one in Column II and select the correct match from the codes given:

Column I	**Column II**
A. Peripheral neural system	P. Comprises of all nerves associated with brain and spinal cord
B. Somatic neural system	Q. Relays impulses from CNS to skeletal muscles
C. Visceral neural system	R. Transmits impulse from CNS to involuntary organs and smooth muscles
D. Autonomic neural system	S. Part of PNS where impulses travel from CNS to the viscera and from the viscera to the CNS

Codes:

	A	B	C	D
1.	P	Q	R	S
2.	Q	R	S	P
3.	R	S	P	Q
4.	S	P	Q	R

3 Sympathetic and parasympathetic neural systems are divisions of:

1. CNS	2. Somatic neural system
3. Autonomic neural system	4. Visceral neural system

4 Consider the following statements:

I:	Impulses travel by the visceral nervous system from the CNS to the viscera and from the viscera to the CNS.
II:	Impulses travel by the autonomic nervous system from the CNS to the involuntary organs and smooth muscles of the body.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

5 Consider the given two statements:

Assertion(A):	The nervous system is the master control system of the body, responsible for coordinating all its activities.
Reason(R):	The nervous system is divided into the central nervous system (CNS) and the peripheral nervous system (PNS).

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	**(A)** is False but **(R)** is True.

6 Identify the incorrect statement:

1.	The central nervous system includes the brain and the spinal cord.
2.	The peripheral nervous system comprises of all the nerves of the body associated with the central nervous system.
3.	The afferent nerve fibers transmit regulatory impulses from the central nervous system to the concerned peripheral tissues or organs.
4.	The peripheral nervous system is divided into two divisions called somatic neural system and autonomic neural system

7 The nerve fibres of the peripheral nervous system (PNS) are of two types:

I:	Afferent nerve fibres transmit impulses from tissues/organs to the central nervous system (CNS)
II:	Efferent fibres transmit regulatory impulses from the CNS to the concerned peripheral tissues/organs

1.	Only **I** is correct	2.	Only **II** is correct
3.	Both **I** and **II** are correct	4.	Both **I** and **II** are incorrect

8 The peripheral nervous system in the human body does not include:

1.	cranial nerve	2.	ganglion
3.	spinal cord	4.	spinal nerve

NEURON AS STRUCTURAL AND FUNCTIONAL UNIT OF NEURAL SYSTEM

9 In a neuron, Nissl's granules are seen in:

I. Cell body	II. Dendrites	III. Axon

1. I and II only	2. I and III only
3. II and III only	4. I, II and III

10 Match each item in Column I with one in Column II and select the correct match from the codes given:

	Column I		Column II
A.	Multipolar neuron	P.	Embryonic stage
B.	Bipolar neuron	Q.	Retina
C.	Unipolar neuron	R.	Cerebral cortex

Code:

	A	B	C
1.	P	Q	R
2.	Q	R	P
3.	R	Q	P
4.	R	P	Q

11 Myelin sheath around the axons in the PNS is secreted by:

1. oligodendrocytes	2. axons
3. Schwann cells	4. ependymal

12 Consider the given two statements:

Assertion (A):	Myelinated neurons transmit nerve impulses faster than unmyelinated neurons.
Reason (R):	Myelinated neurons form electrical synapse wile unmyelinated neurons form chemical synapse.

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	Both **(A)** and **(R)** are False.

13 Branched protoplasmic extensions of a nerve cell that propagate the electrochemical stimulation received from other neural cells to the cell body, or soma, of the neuron are the:

1.	axons	2.	axon hillocks
3.	axon collaterals	4.	dendrites

14 Most of the neurons in the cerebral cortex are:

1.	Unipolar	2.	Bipolar
3.	Multipolar	4.	Pseudounipolar

15 How many of the given statements are correct?

I:	Multipolar neurons are found in the cerebral cortex
II:	Bipolar neurons are found in the retina of eye
III:	Unipolar neurons are found usually in the embryonic stage.
IV:	Unmyelinated nerve fibres are found in spinal and cranial nerves.
V:	Myelinated nerve fibres are commonly found in autonomous and the somatic neural systems.

1. 2
2. 3
3. 4
4. 5

16 There are two types of axons, namely, myelinated and non-myelinated. Find out the correct statement:

I:	The myelinated nerve fibres are enveloped with Schwann cells, which form a myelin sheath around the axon.
II:	Myelinated nerve fibres are found in spinal and cranial nerves.
III:	Unmyelinated nerve fibres are not enclosed by a Schwann cell and a myelin sheath around the axon.
IV:	Unmyelinated nerve fibres are commonly found in autonomous and the somatic neural systems.

1.	**I, II, IV** only	2.	**III** and **IV** only
3.	**I, II, III** and **IV**	4.	None, All are incorrect

17 Nodes of Ranvier are best described as:

1. Synaptic knobs at axonal endings
2. Gaps in myelin sheath
3. The broad part of cell body from where axon arises
4. Points of electrical synapses

18 Nodes of Ranvier primarily function in:

1.	Enhancing neuronal metabolism
2.	Stopping progress of nerve impulse
3.	Speeding up transmission of nerve impulse by saltatory condition
4.	Preventing neuronal damage

19 Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R):

Assertion (A):	Neurons are excitable cells.
Reason (R):	Their membranes are in a polarised state.

In the light of the above statements choose the correct answer from the options given below:

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	**(A)** is False but **(R)** is True.

20 The resting axonal membrane is impermeable to:

I: Sodium ions
II: Potassium ions
III: Negatively charges proteins present in the axoplasm

1.	**I** and **II** only	2.	**I** and **III** only
3.	**II** and **III** only	4.	**I, II** and **III**

21 Each time the sodium-potassium pump functions, it actively transports:

1.	3 sodium ions outwards and 2 potassium ions into the cell.
2.	3 sodium ions into the cells and 2 potassium outwards.
3.	2 sodium ions outwards and 3 potassium ions into the cell.
4.	2 sodium ions into the cells and 3 potassium ions outwards.

22 In a resting axonal membrane:

1.	The outer surface possesses a positive charge while its inner surface becomes negatively charged.
2.	The outer surface possesses a negative charge while its inner surface becomes positively charged.
3.	Both the outer and the inner surface are positively charged.
4.	Both the outer and the inner surface are negatively charged.

23 The electrical potential difference across the resting axonal membrane is called as the:

1. Resting potential	2. Action potential
3. Threshold potential	4. Reversal potential

24 The re-establishment of the resting membrane potential after depolarization is primarily due to:

1. Sodium potassium pump	2. Influx of sodium
3. Efflux of potassium	4. Efflux of sodium

25 Consider the given statements:

I:	When a stimulus is applied at a site on the polarised axonal membrane, the membrane at that site becomes freely permeable to sodium ions.
II:	A rapid influx of sodium at this point leads to reversal of polarity and the membrane at the site is said to be depolarised.
III:	The electric potential difference at the site is called the action potential which is in fact termed as nerve impulse.

1. Only **I** and **II** are correct
2. Only **I** and **III** are correct
3. Only **II** and **III** are correct
4. **I, II** and **III** are correct

26 Which of the following events is likely to happen if diffusion of ions is allowed in a resting polarized axonal membrane?

1. Na^+ will move out of the cell
2. Na^+ will move into the cell
3. K^+ will move into the cell
4. Na^+ and K^+ will both move out of the cell

27 Consider the given two statements:

Statement I:	Depolarisation of axonal membrane is due to influx of sodium ions.
Statement II:	Repolarisation of axonal membrane is due to efflux of sodium ions.

1. **Statement I** is correct; **Statement II** is correct
2. **Statement I** is correct; **Statement II** is incorrect
3. **Statement I** is incorrect; **Statement II** is correct
4. **Statement I** is incorrect; **Statement II** is incorrect

28 The ionic gradients across the resting axonal membrane are maintained by:

1.	the passive transport of sodium and potassium ions through membrane channels.
2.	the passive transport of sodium and chloride ions through membrane channels.
3.	the active transport of ions by the sodium-potassium pump which transports 3 Na^+ outwards for 2 K^+ into the cell.
4.	the active transport of ions by the sodium-chloride pump which transports 3 Na^+ outwards for 2 Cl^- into the cell.

29 Different types of ion channels are present on the neural membrane. When a neuron is not conducting any impulse:

I:	the axonal membrane is comparatively more permeable to potassium ions and nearly impermeable to sodium ions.
II:	the axonal membrane has an excess of negative charge on the outside and an excess of positive charge just on the inside of the membrane.
III:	the axonal membrane is impermeable to negatively charged proteins present in the axoplasm.

1. Only **I** and **II** are correct
2. Only **I** and **III** are correct
3. Only **II** and **III** are correct
4. **I, II** and **III** are correct

30 When a stimulus of adequate strength is applied at a site on the polarised membrane, the membrane at that site becomes:

1. freely permeable to Na^+.
2. freely permeable to K^+.
3. impermeable to Na^+.
4. impermeable to K^+.

31

Assertion(A):	The resting axonal membrane is more permeable to potassium ions than sodium ions
Reason(R):	Potassium is the principal cation in the intracellular fluid.

1. Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2. Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3. **(A)** is True but **(R)** is False.
4. **(A)** is False and **(R)** is True.

32 During the propagation of a nerve impulse, the membrane potential changes in a specific pattern. Which of the following correctly describes the sequence of events in the generation of an action potential?

1. The membrane potential remains constant, indicating a steady state of ion exchange across the neuron membrane.
2. Sodium ions rapidly enter the neuron, causing the membrane potential to become more negative, followed by the exit of potassium ions which restores the membrane to its resting potential.
3. Potassium ions rapidly exit the neuron, leading to hyperpolarization first, followed by sodium ions entering the neuron to return to the resting potential.
4. Sodium ions rapidly enter the neuron, making the inside more positive (depolarization), followed by potassium ions exiting the neuron, which restores the membrane to its resting potential (repolarization).

33 The axoplasm inside the axon contains:

I:	low concentration of K^+
II:	high concentration of negatively charged proteins
III:	high concentration of Na^+

1. Only **I** and **III**
2. **I, II** and **III**
3. Only **II**
4. Only **I** and **II**

34 The sodium-potassium pump in neurons:

1. Moves 3 Na^+ ions out of the cell and 2 K^+ ions into the cell against their concentration gradients.
2. Moves 2 Na^+ ions into the cell and 3 K^+ ions out of the cell using ATP.
3. Does not require ATP to function.
4. Is involved in the generation of the resting membrane potential.

35 When a neuron is resting, the axonal membrane is relatively more permeable to potassium ions and nearly impermeable to sodium ions. This would mean that:

1. in resting conditions, all sodium channels in the axonal membrane are closed while few potassium channels are open
2. in resting conditions, the electrogenic sodium-potassium pump will pump only the sodium ions
3. in resting conditions, the electrogenic sodium-potassium pump will pump only the potassium ions
4. in resting conditions, the outer surface of the axonal membrane will carry a negative charge

36 In the resting state of the neural membrane, diffusion due to concentration gradients, if allowed, would drive

1. K^+ and Na^+ out of the cell.
2. Na^+ into the cell.
3. Na^+ out of the cell.
4. K^+ into the cell.

37 The change in electrical potential that occurs between the inside and outside of a nerve or muscle fiber when it is stimulated, serving to transmit nerve signals is called as:

1. Action potential
2. Threshold potential
3. Reversal potential
4. Excitatory post synaptic potential

38 What causes the movement of the synaptic vesicles towards the membrane during transmission of impulse across a chemical synapse?

1. Sodium	2. Calcium
3. cAMP	4. cGMP

39 At a chemical synapse:

I:	neurotransmitters are involved in the transmission of impulses.
II:	the axon terminals contain vesicles filled with the neurotransmitters.
III:	the released neurotransmitters bind to their specific receptors, present on the post-synaptic membrane.

1. Only **I** and **II** are correct
2. Only **I** and **III** are correct
3. Only **II** and **III** are correct
4. **I**, **II** and **III** are correct

40

Assertion (A):	Electrical synapses are rarer than chemical synapses in human body.
Reason(R):	Electrical synapses are faster than chemical synapses.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
3.	**(A)** is True but **(R)** is False
4.	Both **(A)** and **(R)** are False

41 What is a key difference between electrical and chemical synapses?

1.	Electrical synapses allow the direct flow of ions from one neuron to another, while chemical synapses involve the release of neurotransmitters.
2.	Chemical synapses can transmit signals faster than electrical synapses.
3.	Electrical synapses involve neurotransmitters, whereas chemical synapses do not.
4.	Chemical synapses are found in the heart, while electrical synapses are found in the brain.

42 What is a key feature of a chemical synapse?

1.	Electrical signal directly passes from one neuron to another.
2.	It primarily occurs in the heart.
3.	It does not involve synaptic cleft.
4.	It involves the release of neurotransmitters.

43 The term 'saltatory conduction' is used for conduction of impulse in a myelinated neuron when an impulse jumps from:

1. axon to dendrite
2. node to node
3. dendrite to axon
4. node of Ranvier to axon

CENTRAL NEURAL SYSTEM

44 The correct chronological order [superficial to deep] of the meninges is:

1. dura mater - pia mater - arachnoid mater
2. dura mater - arachnoid mater - pia mater
3. pia mater - dura mater - arachnoid mater
4. pia mater - arachnoid mater - dura mater

45 The cranial meninge that is in contact with the brain tissue is the:

1. Dura mater	2. Arachanoid mater
3. Pia mater	4. Grey matter

46 The human forebrain consists of all the following except:

1.	cerebrum	2.	thalamus
3.	hypothalamus	4.	cerebellum

47 The two cerebral hemispheres in the human brain are connected by a tract of nerve fibres called:

1.	corpus striatum	2.	corpus callosum
3.	corpus luteum	4.	corpus unigemina

48 The cerebrum wraps around a structure called thalamus, which is:

1.	the highest set of regulation of the functions in human body.
2.	a major coordinating centre for sensory and motor signaling.
3.	involved in decoding the sense of olfaction.
4.	vestigial in human beings.

49 Consider the given two statements:

I:	The cerebral cortex, referred to as the grey matter, is thrown into prominent folds.
II:	The cerebral white mater contains motor areas, and association area.

1. Both are correct	2. Both are incorrect
3. Only I is correct	4. Only II is correct

50 Consider the two statements:

Assertion (A):	The cerebral cortex is referred to as the grey matter.
Reason (R):	Myelin sheaths around the axons give the cerebral cortex a grey appearance.

1.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	**(A)** is False but **(R)** is True.

51 Consider the given two statements:

I:	The association areas of the cerebral cortex are neither clearly sensory nor motor in function.
II:	The association areas are responsible for complex functions like intersensory associations, memory and communication.

1.	Both are correct	2.	Both are incorrect
3.	Only I is correct	4.	Only II is correct

52 Which part of the human brain:

I:	has hunger, satiety, and sleep centers.
II:	affects activities of the endocrine system.
III:	plays a role in emotional responses such as rage, pain, and pleasure.

1.	medulla	2.	pons
3.	midbrain	4.	hypothalamus

53 Limbic system is involved in the regulation of sexual behaviour, expression of emotional reactions (e.g., excitement, pleasure, rage and fear), and motivation primarily along with:

1. cerebrum
2. hypothalamus
3. thalamus
4. mid brain

54 The hypothalamus in the human brain does not play a direct role in:

1. Thermoregulation
2. Osmoregulation
3. Endocrine functions
4. Gastric secretions

55 The hypothalamus:

I:	is a part of the rhombencephalon.
II:	contains a number of centres which control body temperature, urge for eating and drinking.
III:	contains several groups of neurosecretory cells, which secrete hormones called hypothalamic hormones.

1. Only **I** and **II** are correct
2. Only **I** and **III** are correct
3. Only **II** and **III** are correct
4. **I, II** and **III** are correct

56 Which structure of the human brain will form a part of the diencephalon?

1. Cerebral cortex
2. Olfactory bulbs
3. Hypothalamus
4. Pons Varolii

57 Which of the following part of the limbic system plays important role in consolidating short term memory into long term memory?

1.	Amygdala	2.	Septum
3.	Hippocampus	4.	Olfactory bulbs

58 Which part of the human brain is associated with emotions, long term memory and behaviour?

1.	Cerebellum	2.	Cerebrum
3.	Limbic system	4.	Brain stem

59 The midbrain:

I:	is located between the thalamus/hypothalamus of the forebrain and pons of the hindbrain.
II:	is the part of the brain traversed by the cerebral aqueduct.
III:	consists mainly of four round swellings (lobes) called corpora cavernosa.

1. Only **I** and **II** are correct
2. Only **I** and **III** are correct
3. Only **II** and **III** are correct
4. **I, II** and **III** are correct

60 The brainstem includes:

I. medulla oblongata
II. midbrain
III. pons
IV. thalamus

1. Only I, II and III
2. Only I, II and IV
3. Only II, III and IV
4. I, II, III and IV

61 A canal called the cerebral aqueduct passes through the:

1. Cerebral hemispheres	2. Diencephalon
3. Mid brain	4. Hind brain

62 Consider the given two statements:

Statement I:	The left and right cerebral hemispheres are connected by a tract of nerve fibres called corpus callosum.
Statement II:	A canal called the cerebral aqueduct passess through the midbrain.

1. **Statement I** is correct; **Statement II** is correct
2. **Statement I** is correct; **Statement II** is incorrect
3. **Statement I** is incorrect; **Statement II** is correct
4. **Statement I** is incorrect; **Statement II** is incorrect

63 The corpora quadrigemina are part of the human:

1.	Telencephalon	2.	Diencephalon
3.	Mid brain	4.	Hind brain

64 How many of the given statements are correct?

I:	Hind brain and midbrain make up the brain stem.
II:	The hindbrain comprises pons, cerebellum and medulla.
III:	The forebrain consists of cerebrum, thalamus and hypothalamus.

1. 0
2. 1
3. 2
4. 3

65 Which part of the human hindbrain consists of fibre tracts that interconnect different regions of the brain?

1. pons
2. cerebellum
3. medulla oblongata
4. corpora quadrigemina

66 Medulla oblongata:

I:	is a part of the brain stem
II:	is a part of the hind brain
III:	is a part of the limbic system

1.	Only **I** and **II**	2.	Only **I** and **III**
3.	Only **II** and **III**	4.	**I, II** and **III**

67 The medulla oblongata contains centres for control of all the following except:

1. respiration
2. cardiovascular reflexes
3. gastric secretions
4. thermoregulation

68 The key function of the cerebellum is to:

1.	Regulate heart rate and blood pressure.
2.	Control voluntary movements and coordinate fine motor skills.
3.	Control emotions and produce feelings.
4.	Regulate body temperature and water balance.

69 Match each item in Column I [part of the brain] with one in Column II [function] and select the answer from the codes given below:

	Column I		Column II
A.	Amygdala	a.	Relays motor and sensory signals to the cerebral cortex
B.	Hippocampus	b.	Reflex centers involving vision and hearing
C.	Thalamus	c.	Plays a key role in the processing of emotions
D.	Corpora quadrigemina	d.	Formation of new memories and is also associated with learning and emotions

Codes

	A	B	C	D
1.	c	d	b	a
2.	d	c	a	b
3.	c	d	a	b
4.	d	c	b	a

70 Match each item in Column I [part of the brain] with one in Column II [function] and select the answer from the codes given below:

	Column I		Column II
A.	Medulla oblongata	a.	Motor control
B.	Pons varoli	b.	Hunger center
C.	Cerebellum	c.	Bridge between cerebellum and rest of brain
D.	Hypothalamus	d.	Gastric secretions, respiratory rhythm center

Codes

	A	B	C	D
1.	c	d	b	a
2.	d	c	a	b
3.	c	d	a	b
4.	d	c	b	a

71 Match the parts of the brain with their functions:

	Column I		Column II
A.	Cerebrum	i.	Coordination of movement and balance
B.	Cerebellum	ii.	Regulation of heart rate and breathing
C.	Medulla oblongata	iii.	Seat of intelligence, memory, and emotions

1. A-iii, B-i, C-ii
2. A-ii, B-iii, C-i
3. A-i, B-ii, C-iii
4. A-iii, B-ii, C-i

72 Identify the incorrectly matched pair:

1.	Limbic system	Behaviour
2.	Medulla oblongata	Gastric secretions
3.	Hypothalamus	Thermoregulation
4.	Corpus callosum	Connects cerebellum with rest of the brain

73 Identify the incorrectly matched pair:

1.	Medulla oblongata	Gastric secretions
2.	Hypothalamus	Control of body temperature
3.	Limbic system	Behaviour
4.	Association areas	Purely sensory areas in the cerebrum

NEURAL CONTROL AND COORDINATION - ANSWER KEY

1.	(2)	2.	(1)	3.	(3)	4.	(3)	5.	(2)	6.	(3)	7.	(3)	8.	(3)	9.	(1)	10.	(3)
11.	(3)	12.	(3)	13.	(4)	14.	(3)	15.	(2)	16.	(1)	17.	(2)	18.	(3)	19.	(1)	20.	(2)
21.	(1)	22.	(1)	23.	(1)	24.	(3)	25.	(4)	26.	(2)	27.	(2)	28.	(3)	29.	(2)	30.	(1)
31.	(2)	32.	(4)	33.	(3)	34.	(1)	35.	(1)	36.	(2)	37.	(1)	38.	(2)	39.	(4)	40.	(2)
41.	(1)	42.	(4)	43.	(2)	44.	(2)	45.	(3)	46.	(4)	47.	(2)	48.	(2)	49.	(3)	50.	(3)
51.	(1)	52.	(4)	53.	(2)	54.	(4)	55.	(3)	56.	(3)	57.	(3)	58.	(3)	59.	(1)	60.	(1)
61.	(3)	62.	(1)	63.	(3)	64.	(3)	65.	(1)	66.	(1)	67.	(4)	68.	(2)	69.	(3)	70.	(2)
71.	(1)	72.	(4)	73.	(4)														

ENDOCRINE GLANDS AND HORMONES

1 The neural system:

I:	provides a point-to-point rapid coordination among organs.
II:	is fast but short-lived.
III:	innervate all cells of the body.

1. Only **I** and **II** are correct
2. Only **I** and **III** are correct
3. Only **II** and **III** are correct
4. **I**, **II** and **III** are correct

2 Unlike neurotransmitters, hormones:

1.	are all proteins.
2.	can have a long lasting effect on their target cells.
3.	are not transported by blood.
4.	provide a point-to-point rapid coordination among organs

3 The definition of hormone describes them as having all the following features except:

1. non-nutrient chemicals
2. intra-cellular messengers
3. produced in trace amounts
4. act on distant target organ

4 Consider the two statements:

Assertion (A):	Apart from the organised endocrine glands, hormones are secreted by other parts of the human body as well.
Reason (R):	Hormone is any non-nutrient chemical which acts as intercellular messenger and is produced in trace amounts.

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	Both **(A)** and **(R)** are False.

5 Consider the given two statements:

Assertion (A):	Hormones act only on their target cells.
Reason (R):	Hormones are transported to their target organs by ducts.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	**(A)** is True but **(R)** is False
3.	**(A)** is False but **(R)** is False
4.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.

6 Consider the given two statements:

Statement I:	The classical definition of hormone describes hormone as a chemical produced by exocrine glands, released into the blood and transported to a nearby located target organ.
Statement II:	Current scientific definition describes hormones as non-nutrient chemicals which act as intercellular messengers and are produced in trace amounts.

1. Statement **I** is incorrect; Statement **II** is correct
2. Statement **I** is correct; Statement **II** is incorrect
3. Statement **I** is correct; Statement **II** is correct
4. Statement **I** is incorrect; Statement **II** is incorrect

7 Consider the given two statements:

Statement I:	A special kind of coordination and integration function is carried out by hormones in our body.
Statement II:	The neural system does not innervate all cells of the body and the cellular functions need to be continuously regulated.

1. **Statement I** is incorrect; **Statement II** is correct
2. **Statement I** is correct; **Statement II** is incorrect
3. **Statement I** is correct; **Statement II** is correct
4. **Statement I** is incorrect; **Statement II** is incorrect

8 Which of the following statements about the endocrine system are correct?

I:	Hormones are transported by the bloodstream.
II:	Hormones act on specific target tissues that have receptors for them.
III:	The endocrine system works in a coordinated manner with the nervous system.
IV:	All endocrine glands are ductless.

1. **I**, **II**, and **III** only
2. **I**, **II**, and **IV** only
3. **I**, **III**, and **IV** only
4. **I**, **II**, **III**, and **IV**

9 When compared to the vertebrates, invertebrates:

1.	do not have any endocrine system.
2.	possess very simple endocrine systems with few hormones.
3.	possess very complex endocrine systems with a large number of hormones.
4.	produce only steroidal hormones.

HUMAN ENDOCRINE SYSTEM

10 Endocrine glands:

I:	are located only in the cranial and thoracic regions of the human body.
II:	are ductless glands.
III:	secrete hormones.

1. Only **I** and **II** are correct
2. Only **I** and **III** are correct
3. Only **II** and **III** are correct
4. **I**, **II** and **III** are correct

11 The number of organised endocrine bodies in the thoracic region of a human being will be:

1.	1	2.	2
3.	3	4.	4

12 The number of organised endocrine bodies in the head and neck region of a human being will be:

1.	1	2.	2
3.	3	4.	4

13 The number of organised endocrine glands:

1.	is more in males than in females.
2.	is more in females than in males.
3.	is equal in males than in females.
4.	is variable amongst adult males and adult females.

14 The number of organised endocrine bodies in the abdominal region of a human being will be
[paired bodies to be considered as 1]:

1. 1
2. 2
3. 3
4. 4

15 Organs that are not organised endocrine bodies but produce hormones will include:

a. Gastrointestinal tract
b. Liver
c. Kidney
d. Heart

1. Only a and b
2. Only c and d
3. Only a, b and c
4. a, b, c, and d

16 The hypothalamus:

Statement I:	is the apical part of diencephalon, forebrain.
Statement II:	contains several groups of neurosecretory cells called nuclei which produce hormones.

1. **Statement I** is incorrect; **Statement II** is correct
2. **Statement I** is correct; **Statement II** is incorrect
3. **Statement I** is correct; **Statement II** is correct
4. **Statement I** is incorrect; **Statement II** is incorrect

17 Consider the given two statements:

Assertion (A):	The hypothalamus secretes releasing hormones that directly stimulate the anterior pituitary to secrete its own specific hormones.
Reason (R):	The anterior pituitary secretes hormones into the bloodstream that act directly on the hypothalamus to inhibit further hormone secretion.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**
2.	Both **(A)** and **(R)** are True and **(R)** does not correctly explain **(A)**
3.	**(A)** is True, **(R)** is False
4.	**(A)** is False, **(R)** is False

18 Consider the given two statements:

Statement I:	A hypothalamic hormone called Gonadotrophin releasing hormone (GnRH) stimulates the synthesis and release of gonadotrophins by gonads.
Statement II:	Somatostatin from the hypothalamus stimulates the release of growth hormone from the pituitary.

1. **Statement I** is incorrect; **Statement II** is correct
2. **Statement I** is correct; **Statement II** is incorrect
3. **Statement I** is correct; **Statement II** is correct
4. **Statement I** is incorrect; **Statement II** is incorrect

19 Consider the given two statements:

Statement I:	Releasing hormones and inhibitory hormones from the hypothalamus reach the pituitary gland through a portal circulatory system and regulate the functions of the posterior pituitary.
Statement II:	The anterior pituitary is under the direct neural regulation of the hypothalamus.

1. **Statement I** is incorrect; **Statement II** is correct
2. **Statement I** is correct; **Statement II** is incorrect
3. **Statement I** is correct; **Statement II** is correct
4. **Statement I** is incorrect; **Statement II** is incorrect

20 Which of the following endocrine glands is under direct neural regulation of hypothalamus?

1. Pineal	2. Adrenal medulla
3. Posterior pituitary	4. Anterior pituitary

21 Pars distalis is:

1.	the posterior lobe of pituitary made of neural tissue
2.	the well developed intermediate lobe of pituitary in humans
3.	the major part of the adenohypophysis
4.	the connection between anterior pituitary and hypothalamus

22 The anterior pituitary gland in humans:

I:	is the storage and release centre for neurohormones produced elsewhere
II:	is connected to hypothalamus by a portal circulation
III:	is also called as adenohypophysis

1. Only **II** is correct
2. Only **III** is correct
3. Only **I** and **III** are correct
4. Only **II** and **III** are correct

23 The pituitary gland

I:	is divided anatomically into an adenohypophysis and a neurohypophysis.
II:	Adenohypophysis consists of two portions, pars distalis and pars intermedia.

1.	Both I and II are correct
2.	Both I and II are incorrect
3.	I is correct, II is incorrect
4.	I is incorrect, II is correct

24 Which hormone is not secreted by adenohypophysis in humans?

1. Growth hormone
2. Follicle stimulating hormone
3. Oxytocin
4. Adrenocorticotrophic hormone

25 The only hormone secreted by pars intermedia of hypophysis is:

1. MSH	2. GnRH
3. Vasopressin	4. Prolactin

26 Identify the correct statements:

I:	The pars distalis region of pituitary, commonly called anterior pituitary, produces GH, PRL, TSH, ACTH, LH and FSH.
II:	Pars intermedia secretes only one hormone called melanocyte stimulating hormone (MSH).
III:	In humans, the pars intermedia is almost merged with pars nervosa.

1. Only **I** and **II**
2. Only **I** and **III**
3. Only **II** and **III**
4. **I**, **II** and **III**

27 Identify the correctly matched pair:

	Part of the pituitary	**Hormone synthesized**
I:	Pars distalis	Gonodotropin releasing hormone
II:	Pars intermedia	Melanocyte stimulating hormone
III:	Pars nervosa	ADH and oxytocin

1.	Only **III**	2.	Only **II**
3.	Only **I** and **II**	4.	Only **II** and **III**

28 Neurohypophysis (pars nervosa):

I:	is also known as posterior pituitary.
II:	stores and releases two hormones called oxytocin and vasopressin.

1. Both **I** and **II** are correct
2. Both **I** and **II** are incorrect
3. **I** is correct, **II** is incorrect
4. **I** is incorrect, **II** is correct

29 Oxytocin and vasopressin:

I:	are actually synthesised by the hypothalamus.
II:	are transported through a portal vein to neurohypophysis.

1. Both **I** and **II** are correct
2. Both **I** and **II** are incorrect
3. **I** is correct, **II** is incorrect
4. **I** is incorrect, **II** is correct

30 A hormonal disorder that develops when pituitary gland produces too much growth hormone during adulthood is known as:

1. cretinism	2. gigantism
3. Conn's syndrome	4. acromegaly

31 Over-secretion of GH:

I:	in childhood leads to gigantism.
II:	in adults especially in middle age can result in severe disfigurement (especially of the face) called Acromegaly.

1. Both **I** and **II** are correct
2. Both **I** and **II** are incorrect
3. **I** is correct, **II** is incorrect
4. **I** is incorrect, **II** is correct

32 Identify the correct statement from the following:

Statement I:	Prolactin causes the milk ejection from the mammary glands.
Statement II:	Oxytocin regulates the formation of milk in the mammary glands.
Statement III:	FSH stimulates growth and development of ovarian follicles in females.
Statement IV:	MSH acts on melanocytes and regulates the secretion of melatonin.

1.	Only **III**	2.	Only **III** and **IV**
3.	**I**, **II** and **III** only	4.	**II** and **III** only

33 How many of the given statements are correct?

I:	In males, LH stimulates the synthesis and secretion of hormones called androgens from testis.
II:	In males, FSH and androgens regulate spermatogenesis.
III:	In females, LH induces ovulation of fully mature follicles (graafian follicles) and maintains the corpus luteum, formed from the remnants of the graafian follicles after ovulation.
IV:	FSH stimulates growth and development of the ovarian follicles in females.

1.	1	2.	2
3.	3	4.	4

34 ADH and oxytocin are synthesized by:

1. Anterior pituitary	2. Hypothalamus
3. Pars intermedia	4. Pars nervosa

35 Which of the following is sometimes also called as the 'birth' hormone?

1.	Oestrogen	2.	Progesterone
3.	Oxytocin	4.	Prolactin

36 Pars nervosa:

1. synthesises ADH and oxytocin
2. stores and releases ADH and oxytocin
3. reuptake ADH and oxytocin from the synaptic cleft
4. secretes an inhibitor of ADH and oxytocin

37 Oxytocin:

I:	in females, stimulates a vigorous contraction of uterus at the time of child birth.
II:	is a steroidal hormone.
III:	causes milk ejection from the mammary gland.

1. Only **I** and **II** are correct
2. Only **I** and **III** are correct
3. Only **II** and **III** are correct
4. **I, II** and **III** are correct

38 How do the neurohormones, oxytocin and antidiuretic hormone, reach the posterior pituitary?

1. By a portal vein
2. By a lymphatic vessel
3. By diffusion from the anterior pituitary gland
4. By axons

39 Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R):

Assertion (A):	Oxytocin helps in parturition and causes milk ejection from the mammary glands.
Reason (R):	Oxytocin acts on the smooth muscles of our body and stimulates their contraction.

In the light of the above statements choose the correct answer from the options given below:

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	Both **(A)** and **(R)** are False.

40 Diabetes insipidus, characterized by water loss and dehydration, is caused by:

1.	Hyposecretion of ADH	2.	Hypersecretion of ADH
3.	Hyposecretion of insulin	4.	Hypersecretion of insulin

41 Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R):

Assertion (A):	Vasopressin is also called as Anti Diuretic Hormone [ADH].
Reason (R):	It is a vasoconstrictor.

In the light of the above statements choose the correct answer from the options given below:

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	Both **(A)** and **(R)** are False.

42 Consider the given two statements:

Assertion (A):	Deficiency of ADH causes diabetes insipidus.
Reason (R):	ADH promotes the expulsion of water from the collecting duct, a portion of the nephron.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	**(A)** is True; **(R)** is False
3.	Both **(A)** and **(R)** are False
4.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.

43 Consider the given two statements:

Assertion (A):	An impairment affecting synthesis or release of ADH results in a diminished ability of the kidney to conserve water leading to water loss and dehydration.
Reason (R):	Vasopressin acts mainly at the kidney and stimulates resorption of water and electrolytes by the distal tubules.

1. **(A)** is True; **(R)** is False
2. Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**
3. Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**
4. **(A)** is False; **(R)** is True

44 When dehydration occurs, the response of the human body would be that:

1. More ADH is secreted.
2. Urine will become less concentrated.
3. Diuretic hormone will be secreted.
4. The urine output will increase.

45 Identify the correct statement regarding the pineal gland or the hormone secreted by it:

1. The gland is situated on the ventral side of the forebrain
2. The hormone secreted by the gland is called as melanin
3. The hormone regulates the diurnal rhythm of our body
4. The hormone decreases immunity

46 The pineal gland:

I:	helps in maintaining the normal rhythms of sleep-wakefulness cycle and body temperature.
II:	influences metabolism, pigmentation and the menstrual cycle.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

47 Pineal secretes a hormone called:

1. melanin, a derivative of tyrosine.
2. melatonin, a derivative of tryptophan
3. MSH, a peptide hormone
4. MDPA, a steroid

48 Melatonin:

I:	plays a very important role in the regulation of a 24-hour (diurnal) rhythm of our body.
II:	influences metabolism, pigmentation, the menstrual cycle as well as our defense capability.

1. Both **I** and **II** are correct
2. Both **I** and **II** are incorrect
3. **I** is correct, **II** is incorrect
4. **I** is incorrect, **II** is correct

49 The thyroid gland:

I:	is composed of two lobes interconnected with a thin flap of connective tissue called isthmus.
II:	is composed of follicles and stromal tissues.
III:	is located in the mediastinum, ventral to aorta.

1. Only **I** and **II** are correct
2. Only **I** and **III** are correct
3. Only **II** and **III** are correct
4. **I, II** and **III** are correct

50 Identify the incorrect statement regarding thyroid gland:

1. The two lobes are connected by an isthmus
2. Iodine is essential for synthesis of T3 and T4 by thyroid
3. The follicles are lined by cuboidal epithelium
4. All hormones secreted by thyroid are iodothyronines

51 Consider the given statements:

Statement I:	Thyroid follicular cells synthesise three hormones: thyroxine, triiodothyronine and thyrocalcitonin.
Statement II:	Iodine is essential for the normal rate of hormone synthesis in the thyroid.

1. **Statement I** is incorrect; **Statement II** is correct
2. **Statement I** is correct; **Statement II** is incorrect
3. **Statement I** is correct; **Statement II** is correct
4. **Statement I** is incorrect; **Statement II** is incorrect

52 Which of the following clinical feature is unlikely to be seen in hypothyroidism?

1.	A decrease in basal metabolic rate
2.	Mental retardation and growth retardation of baby if pregnant female is affected
3.	Exopthalmic goiter
4.	Irregular menstrual cycles in adult women

53 During pregnancy, the deficiency of which of the following can cause defective development and maturation of the growing baby leading to stunted growth, mental retardation, abnormal skin and deaf-mutism?

1.	Calcium	2.	Iron
3.	Iodine	4.	Nitrogen

54 Graves' disease is characterized by all the following except:

1.	Exopthalmos	2.	Tachycardia
3.	Toxic goiter	4.	Weight gain

55 Exophthalmic goitre is a form of:

1. Hyperparathyroidism
2. Hyperthyroidism
3. Hypercortisolism
4. Hyperadrenalism

56 How many of the given statements are correct:

I:	Thyroid hormones play an important role in the regulation of the basal metabolic rate.
II:	Thyroid hormones are most important factors that affect the process of red blood cell formation.
III:	Thyroid hormones control the metabolism of carbohydrates but not of proteins and fats.
IV:	Maintenance of water and electrolyte balance is also influenced by thyroid hormones.

1.	1	2.	2
3.	3	4.	4

57 Thyroid gland in humans play an important role in:

I: Regulation of basal metabolic rate.
II: Mental development
III: Calcium homeostasis

1.	Only **I** and **II**	2.	Only **I** and **III**
3.	Only **II** and **III**	4.	**I, II** and **III**

58 The peptide thyroid hormone that lowers calcium and phosphate ion concentration in the blood is:

1. thyroxine	2. triiodothyronine
3. calcitonin	4. thyroid-stimulating hormone

59 Which peptide hormone is secreted by the cells of thyroid gland?

1. Triiodothyronine
2. Tetraiodothyronine
3. Parathyroid hormone
4. Thyrocalcitonin

60 All the following statements regarding parathyroid hormone are correct except:

1.	It is a peptide hormone
2.	It is regulated by a tropin secreted by anterior pituitary
3.	It stimulates the process of bone resorption or demineralization
4.	It stimulates calcium absorption from the digested food

61 All the following regarding parathyroid glands are true except:

1.	They usually include four small glands.
2.	They are embedded in the posterior surfaces of the lateral lobes of the thyroid gland.
3.	They secrete parathyroid hormone and calcitonin.
4.	They play a critical role in calcium homeostasis.

62 A patient suffering from hyperparathyroidism may have:

I: increased bone deposition
II: increased risk of fractures

1.	Only **I**	2.	Only **II**
3.	Both **I** and **II**	4.	Neither **I** nor **II**

63 In humans:

1.	four parathyroid glands are present on the back side of the thyroid gland, one pair each in the two lobes of the thyroid gland.
2.	four parathyroid glands are present on the front side of the thyroid gland, one pair each in the two lobes of the thyroid gland.
3.	two parathyroid glands are present on the back side of the thyroid gland, one each in the two lobes of the thyroid gland.
4.	two parathyroid glands are present on the front side of the thyroid gland, one each in the two lobes of the thyroid gland.

64 Which of the following conditions will stimulate parathyroid gland to release parathyroid hormone ?

1. Fall in active Vitamin D levels
2. Fall in blood Ca^{+2} levels
3. Fall in bone Ca^{+2} levels
4. Rise in blood Ca^{+2} levels

65 PTH is a hypercalcemic hormone. Which of the following statements will explain this function of PTH?

I:	PTH acts on bones and stimulates the process of bone resorption (dissolution/demineralisation).
II:	PTH stimulates reabsorption of Ca^{2+} by the renal tubules
III:	PTH increases Ca^{2+} absorption from the digested food

1.	Only **I** and **II**	2.	Only **I** and **III**
3.	Only **II** and **III**	4.	**I, II** and **III**

66 Thymus:

I:	is located ventral to the heart/aorta
II:	plays a major role in differentiation of T-lymphocytes
III:	promotes production of antibodies
IV:	enlarges with age

1. Only **I, II** and **III** are correct
2. Only **I, III** and **IV** are correct
3. Only **II, III** and **IV** are correct
4. **I, II, III** and **IV** are correct

67 Consider the given two statements:

Assertion (A):	The immune responses of old persons become weak.
Reason (R):	Thymus is degenerated in old individuals resulting in a decreased production of thymosins.

1.	**(A)** is True but **(R)** is False.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
4.	**(A)** is False but **(R)** is True.

68 Addison's disease is:

1.	hypothyroidism	2.	hyperthyroidism
3.	hypoadrenalism	4.	hypopituitarism

69 What term/s would describe adrenaline and noradrenaline?

1. neurotransmitter	2. hormone
3. neurotransmitter and hormone	4. steroid hormone

70 How many of the following will be the functions of adrenaline and noradrenaline?

I:	increase in heart rate
II:	decrease in the strength of heart contraction
III:	increase in the rate of respiration
IV:	glycogenolysis
V:	breakdown of lipids and proteins

1.	2	2.	3
3.	4	4.	5

71 Adrenaline and noradrenaline are commonly called as:

1.	Sterols	2.	Catecholamines
3.	Hopanoids	4.	Terpenes

72 Adrenaline and noradrenaline:

I: increase alertness
II: dilate pupil
III: cause piloerection (raising of hairs)

1. Only **I** and **II** are correct
2. Only **I** and **III** are correct
3. Only **II** and **III** are correct
4. **I**, **II** and **III** are correct

73 Consider the two statements:

Assertion(A):	Adrenaline and noradrenaline are called emergency hormones or hormones of Fight or Flight.
Reason(R):	Adrenaline and noradrenaline are monoamine neurotransmitters.

1.	**(A)** is True; **(R)** is False
2.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**
3.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**
4.	**(A)** is False; **(R)** is True

74 Consider the given two statements:

I:	Catecholamines, Adrenaline, and Noradrenaline, are called emergency hormones or hormones of Fight or Flight.
II:	They are rapidly secreted in response to stress of any kind and during emergency situations.

1. Both **I** and **II** are correct and **II** explains **I**
2. Both **I** and **II** are correct but **II** does not explain **I**
3. **I** is correct but **II** is incorrect
4. Both **I** and **II** are incorrect

75 Match each item in Column I [zones of adrenal cortex] with one in Column II [hormone produced] and select your answer from the codes given:

	Column I		**Column II**
A.	Zona glomerulosa	a.	Aldosterone
B.	Zona fasciculata	b.	Cortisol
C.	Zona reticularis	c.	Adrenal androgens

Codes

	A	B	C
1.	a	b	c
2.	a	c	b
3.	b	a	c
4.	b	c	a

76 Identify the correct statement from the following:

I:	The adrenal cortical hormones are commonly called as corticoids.
II:	Cortisol is the main glucocorticoid and aldosterone the main mineralocorticoid in our body.
III:	Small amounts of androgenic steroids are also secreted by the adrenal cortex.

1.	Only **II** and **III**	2.	Only **I** and **II**
3.	**I**, **II** and **III**	4.	Only **II**

77 The adrenal cortex produces several hormones crucial for homeostasis. Which of the following hormones is NOT secreted by the adrenal cortex?

1. Cortisol
2. Aldosterone
3. Adrenaline
4. Androgens

78 Consider the given two statements:

Assertion (A):	Cortisol increases blood glucose levels.
Reason (R):	Cortisol increases the glucose uptake by the body cells.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	**(A)** is True; **(R)** is False
3.	**(A)** is False; **(R)** is False
4.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.

79 The metabolic functions of cortisol include:

I:	Gluconeogenesis
II:	Lipolysis
III:	Protein anabolism

1. Only **I** and **II**
2. Only **I** and **III**
3. Only **II** and **III**
4. **I**, **II** and **III**

80 Which of the following produces anti-inflammatory reactions and suppresses the immune response?

1.	Thyroxine	2.	Thymosin
3.	Cortisol	4.	Aldosterone

81 Which of the following cannot be regarded as a main function of cortisol?

1.	Increased blood sugar by gluconeogenesis
2.	Lipolysis, proteolysis and decreased uptake of amino acids by body cells
3.	Regulation of water and minerals in the body
4.	Suppression of inflammation and immunity

82 The function of aldosterone is mainly:

1.	reabsorption of sodium and water at distal renal tubules
2.	growth of axial, pubic and facial hair
3.	vasodilation leading to polyuria
4.	mobilization of metabolites for energy

83 Aldosterone causes:

I:	Reabsorption of sodium ions by the distal parts of the tubules.
II:	Secretion of potassium ions by the distal parts of the tubules.

1.	Only **I**	2.	Only **II**
3.	Both **I** and **II**	4.	Neither **I** nor **II**

84 Aldosterone:

1.	acts mainly at the renal tubules and stimulates the excretion of Na^+ and water and reabsorption of K^+ and phosphate ions.
2.	acts mainly at the renal tubules and stimulates the reabsorption of Na^+ and water and excretion of K^+ and phosphate ions.
3.	acts mainly at the collecting duct and stimulates the excretion of Na^+ and water and reabsorption of K^+ and phosphate ions.
4.	acts mainly at the collecting duct and stimulates the reabsorption of Na^+ and water and excretion of K^+ and phosphate ions.

85 An excess secretion of aldosterone in the human body is expected to lead to:

I:	an increase in potassium ion concentration in plasma
II:	an increase in the blood pressure

1.	Only **I** is correct
2.	Only **II** is correct
3.	Both **I** and **II** are correct
4.	Both **I** and **II** are incorrect

86 Identify the incorrect statement regarding pancreas:

1.	It is a composite gland which acts as both exocrine and endocrine gland.
2.	The endocrine pancreas consists of 'Islets of Langerhans'.
3.	There are about 1 to 2 million Islets of Langerhans in a normal human pancreas representing 90 percent of the pancreatic tissue.
4.	It is an organ of the digestive system and endocrine system of vertebrates.

87 What would not be true for pancreas?

1.	The exocrine pancreatic acini secrete digestive enzymes
2.	The endocrine islets of Langerhans constitute about 50% of the gland
3.	The hormones secreted by endocrine pancreas are peptides
4.	Alpha cells secrete glucagon, beta cells secrete insulin and delta cells secrete somatostatin

88 An autoimmune disorder that targets the alpha cells of pancreas will cause:

I: an increase in secretion of insulin

II: a decrease in secretion of glucagon

1.	Only **I**	2.	Only **II**
3.	Both **I** and **II**	4.	Neither **I** nor **II**

89 The functions of glucagon do not include:

1. Glycogenolysis
2. Gluconeogenesis
3. Increased cellular glucose uptake
4. Decreased cellular glucose utilization

90 Regarding the two main types of cells in the Islet of Langerhans of pancreas:

A:	The α-cells secrete a hypoglycaemic hormone called glucagon.
B:	The β-cells secrete a hyperglycaemic hormone called insulin.

1. Only **A** is correct
2. Only **B** is correct
3. Both **A** and **B** are correct
4. Both **A** and **B** are incorrect

91 Which of the following hormones is responsible for regulating blood sugar levels by promoting glycogen breakdown in the liver?

1. Insulin
2. Glucagon
3. Growth hormone
4. Thyroxine

92 Select the correct statement about hormones and their actions.

1.	Parathyroid hormone increases K^+ absorption of the body.
2.	Insulin and glucagon help to maintain blood sugar levels.
3.	Old aged people have weak immunity due to increased activity of thymus.
4.	Osteoporosis in women occurs due to increased levels of oestrogens.

93 Identify the hormone:

I. It favours glycogenesis

II. It favours fat synthesis and deposition

III. It favours protein anabolism

1. Cortisol	2. Insulin
3. Growth hormone	4. Adrenaline

94 In males, androgens like testosterone secreted by Leydig cells in testes do not:

1.	regulate the development, maturation and functions of the male accessory sex organs
2.	control the development and regulation of the secondary sexual characters
3.	play a major stimulatory role in the process of spermatogenesis
4.	produce catabolic effects on protein and carbohydrate metabolism

95 Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R):

Assertion (A):	Insulin causes hypoglycemia.
Reason (R):	As a result of action of insulin especially on adipocytes and hepatocytes, there is a rapid movement of glucose from blood to these cells.

In the light of the above statements choose the correct answer from the options given below:

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	Both **(A)** and **(R)** are False.

96 Consider the two statements:

Assertion (A):	Diabetes mellitus is associated with loss of glucose through urine and formation of harmful compounds known as ketone bodies.
Reason (R):	Insulin stimulates conversion of glucose to glycogen (glycogenesis) in the target cells.

1.	**(A)** is True but **(R)** is False.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
4.	**(A)** is False but **(R)** is True.

97 Interstitial cells of Leydig in human testes produce a group of hormones called

1.	Androgens	2.	Estrogens
3.	Aldosterone	4.	Gonadotropins

98 Androgens:

I:	regulate the development, maturation and functions of the male accessory sex organs.
II:	stimulate muscular growth, growth of facial and axillary hair, aggressiveness, low pitch of voice etc.
III:	play a major stimulatory role in the process of spermatogenesis (formation of spermatozoa).
IV:	act on the central neural system and influence the male sexual behaviour (libido).
V:	produce anabolic (synthetic) effects on protein and carbohydrate metabolism.

1. Only **I**, **II** and **III** are correct
2. Only **II**, **III** and **V** are correct
3. Only **III**, **IV** and **V** are correct
4. **I**, **II**, **III**, **IV** and **V** are correct

99 Consider the following regarding the actions of steroidal hormones produced by human ovary:

I:	Estrogen is responsible for the development and maintenance of secondary sexual characters in females
II:	Progesterone is a pregnancy hormone
III:	Estrogen regulates female sexual behavior
IV:	Progesterone stimulates the formation of alveoli in mammary glands

Select correct statements from above statements

1.	**I, II** and **III**	2.	**I, II** and **IV**
3.	**II, III** and **IV**	4.	**I, II, III** and **IV**

100 Identify the incorrect statement:

I:	Ovary is the primary female sex organ and testis is the primary male sex organ.
II:	Oestrogen is synthesised by the growing ovarian follicles and progesterone is secreted by the corpus luteum mainly.

1.	Only **I**	2.	Only **II**
3.	Both **I** and **II**	4.	Neither **I** nor **II**

101 Consider the given two statements:

Statement I:	Estrogens stimulate growth and activities of female secondary sex organs, development of growing ovarian follicles, and appearance of female secondary sex characters.
Statement II:	Progesterone supports pregnancy.

1. **Statement I** is incorrect; **Statement II** is correct
2. **Statement I** is correct; **Statement II** is incorrect
3. **Statement I** is correct; **Statement II** is correct
4. **Statement I** is incorrect; **Statement II** is incorrect

102 Consider the given two statements:

Statement I:	The estrogen is synthesised and secreted mainly by the growing ovarian follicles.
Statement II:	After ovulation, the ruptured follicle is converted to a structure called corpus luteum, which secretes mainly progesterone.

1. **Statement I** is incorrect; **Statement II** is correct
2. **Statement I** is correct; **Statement II** is incorrect

3. **Statement I** is correct; **Statement II** is correct
4. **Statement I** is incorrect; **Statement II** is incorrect

103 Identify the correct statements from the following:

I:	ANF is secreted by the right atrium of heart and causes vasodilation
II:	Erythropoietin is secreted by kidney and stimulates bone marrow to produce RBC
III:	Insulin-like growth factors are secreted by liver and play an important role in childhood growth, and has anabolic effects in adults

1.	Only **I** and **II**	2.	Only **I** and **III**
3.	Only **II** and **III**	4.	**I, II** and **III**

HORMONES OF HEART, KIDNEY AND GASTROINTESTINAL TRACT

104 Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R):

Assertion (A):	Chronic kidney disease can cause anaemia.
Reason (R):	Kidneys produces a peptide hormone, erythropoietin, which stimulates red blood cell production (erythropoiesis) in the bone marrow.

In the light of the above statements choose the correct answer from the options given below:

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	Both **(A)** and **(R)** are False.

105 Match each item in Column I with one in Column II and select the correct match from the codes given:

	Column I		**Column II**
A.	Cholecystokinin	P.	Stimulates the secretion of HCl and pepsinogen by gastric glands
B.	Secretin	Q.	Acts on exocrine pancreas and stimulates the secretion of water and bicarbonate ions
C.	Gastrin	R.	Acts on both exocrine pancreas and gall bladder and stimulates the secretion of pancreatic enzymes and bile juice
D.	Gastric inhibitory peptide	S.	Inhibits gastric secretion and motility and has no effect on exocrine pancreas

Codes:

	A	B	C	D
1.	Q	P	R	S
2.	R	Q	S	P
3.	R	Q	P	S
4.	P	Q	R	S

106 Which hormone produced by the intestinal mucosa causes the secretion of enzymes from the pancreas and the contraction of gall bladder?

1.	cholecystokinin	2.	gastric inhibitory peptide
3.	secretin	4.	gastrin

107 How many of the given statements are correct:

I:	Gastrin acts on the gastric glands and inhibits the secretion of hydrochloric acid and pepsinogen.
II:	Secretin acts on the endocrine pancreas and inhibits secretion of water and bicarbonate ions.
III:	CCK acts on both pancreas and gall bladder and inhibits the secretion of pancreatic enzymes and bile juice, respectively.
IV:	GIP inhibits gastric secretion and motility.

1.	1	2.	2
3.	3	4.	4

108 Which gastrointestinal hormone can cause an increased secretion of HCl by parietal cells?
1. Secretin
2. Cholecystokinin
3. Gastrin
4. Gastric inhibitory peptide

109 Which of the following hormones secreted by the duodenal mucosa acts on the exocrine pancreas and stimulates secretion of water and bicarbonate ions from it?
1. Gastrin
2. Cholecystokinin
3. Secretin
4. Gastric Inhibitory Peptide

110 Match each item in Column I [Hormone] with one in Column II [Chemical class] and select your answer from the codes given:

	Column I		**Column II**
A.	ACTH	a.	Peptide
B.	Estradiol	b.	Steroid
C.	Thyroxine	c.	Amino-acid derived
D.	Epinephrine	d.	Iodothyronine

Codes

	A	B	C	D
1.	a	b	c	d
2.	a	b	d	c
3.	b	a	d	c
4.	b	a	c	d

MECHANISM OF HORMONE ACTION

111 Which pair of hormones will both bind to membrane bound receptors located on its target cells?
1. Epinephrine and thyroxine
2. Calcitonin and glucagon
3. Estradiol and triiodothyronine
4. Adrenaline and aldosterone

112 All the following are common second messengers involved in hormonal actions except:
1. Cyclic adenosine monophosphate
2. Inositol phosphate
3. Prostaglandins
4. Calcium

113 Hormones which interact with intracellular receptors:
1. generate second messengers
2. depolarize the membrane of the target cells
3. stop the enzymatic actions of membrane proteins
4. regulate gene expression

114 Some hormones can act on their target cells through second messengers. Identify the one that does not:

1.	cortisol	2.	adrenaline
3.	FSH	4.	calcitonin

115 Hormones are chemical messengers of all classes except:

1.	peptide	2.	steroid
3.	aminated	4.	carbohydrate

116 All the following chemicals are steroids except:

1.	adrenaline	2.	cholesterol
3.	estrogen	4.	cortisone

117 Consider the given two statements:

Assertion (A):	The receptors for insulin are located inside the cell.
Reason (R):	Insulin is lipid soluble.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	**(A)** is True but **(R)** is False
3.	Both **(A)** and **(R)** are False
4.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.

118 Hormones which interact with intracellular receptors:

I:	include steroid hormones and iodothyronines.
II:	mostly regulate gene expression or chromosome function by the interaction of hormone-receptor complex with the genome.

1. Both **I** and **II** are correct
2. Both **I** and **II** are incorrect
3. **I** is correct, **II** is incorrect
4. **I** is incorrect, **II** is correct

119 Identify the correct statements:

I:	Binding of a hormone to its receptor leads to the formation of a hormone-receptor complex.
II:	Each receptor is specific to one hormone only and hence receptors are specific.
III:	Hormone-Receptor complex formation leads to certain biochemical changes in the target tissue.

1. Only **I** and **II**
2. Only **I** and **III**
3. Only **II** and **III**
4. **I, II** and **III**

120 Consider the given two statements:

Assertion (A):	Steroid hormones act by entering the cell and directly influencing the expression of target genes.
Reason (R):	Steroid hormones bind to the surface receptors and activate second messenger systems.

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	**(A)** is False but **(R)** is True.

121 Match the hormones with their chemical nature:

	Column I		**Column II**
A.	Insulin	P.	Steroid
B.	Thyroxine	Q.	Peptide
C.	Cortisol	R.	Amino acid derivative

Codes:

	A	B	C
1.	P	Q	R
2.	Q	R	P
3.	R	P	Q
4.	Q	P	R

122 Which statement correctly describes the chemical nature of hormones?

1.	All hormones are peptides.
2.	All hormones are steroids.
3.	Hormones can be steroids, peptides, or derivatives of amino acids.
4.	Hormones are primarily carbohydrates.

123 Which of the following correctly describes the role of cAMP and the hormones employing it?

1. binding site; nonsteroid
2. membrane receptor; steroid
3. activity site; G protein
4. second messenger; nonsteroid

CHEMICAL COORDINATION AND INTEGRATION - ANSWER KEY

1.	**(1)**	2.	**(2)**	3.	**(2)**	4.	**(1)**	5.	**(2)**	6.	**(1)**	7.	**(3)**	8.	**(4)**	9.	**(2)**	10.	**(3)**
11.	**(1)**	12.	**(3)**	13.	**(3)**	14.	**(2)**	15.	**(4)**	16.	**(1)**	17.	**(3)**	18.	**(4)**	19.	**(4)**	20.	**(3)**
21.	**(3)**	22.	**(4)**	23.	**(1)**	24.	**(3)**	25.	**(1)**	26.	**(1)**	27.	**(2)**	28.	**(1)**	29.	**(4)**	30.	**(4)**
31.	**(1)**	32.	**(1)**	33.	**(4)**	34.	**(2)**	35.	**(3)**	36.	**(2)**	37.	**(2)**	38.	**(4)**	39.	**(1)**	40.	**(1)**
41.	**(2)**	42.	**(2)**	43.	**(3)**	44.	**(1)**	45.	**(3)**	46.	**(3)**	47.	**(2)**	48.	**(1)**	49.	**(1)**	50.	**(4)**
51.	**(1)**	52.	**(3)**	53.	**(3)**	54.	**(4)**	55.	**(2)**	56.	**(2)**	57.	**(4)**	58.	**(3)**	59.	**(4)**	60.	**(2)**
61.	**(3)**	62.	**(2)**	63.	**(1)**	64.	**(2)**	65.	**(4)**	66.	**(1)**	67.	**(3)**	68.	**(3)**	69.	**(3)**	70.	**(3)**
71.	**(2)**	72.	**(1)**	73.	**(2)**	74.	**(1)**	75.	**(1)**	76.	**(3)**	77.	**(3)**	78.	**(2)**	79.	**(1)**	80.	**(3)**
81.	**(3)**	82.	**(1)**	83.	**(3)**	84.	**(2)**	85.	**(3)**	86.	**(3)**	87.	**(2)**	88.	**(2)**	89.	**(3)**	90.	**(4)**
91.	**(2)**	92.	**(2)**	93.	**(2)**	94.	**(4)**	95.	**(1)**	96.	**(2)**	97.	**(1)**	98.	**(4)**	99.	**(4)**	100.	**(4)**
101.	**(3)**	102.	**(3)**	103.	**(4)**	104.	**(1)**	105.	**(3)**	106.	**(1)**	107.	**(1)**	108.	**(3)**	109.	**(3)**	110.	**(2)**
111.	**(2)**	112.	**(3)**	113.	**(4)**	114.	**(1)**	115.	**(4)**	116.	**(1)**	117.	**(3)**	118.	**(1)**	119.	**(4)**	120.	**(3)**
121.	**(2)**	122.	**(3)**	123.	**(4)**														

THE LIVING WORLD

1 Sometimes the terms such as biological classification, taxonomy and systematics are used as synonyms. However, if we define them separately, which of the following would be acceptable?

I:	Classification is the ordering of organisms into groups
II:	Taxonomy is the study of principles and procedures of classification
III:	Systematics is the study of organisms and their diversities and the evolutionary relationships among them

1.	Only I and II	2.	Only I and III
3.	Only II and III	4.	I, II and III

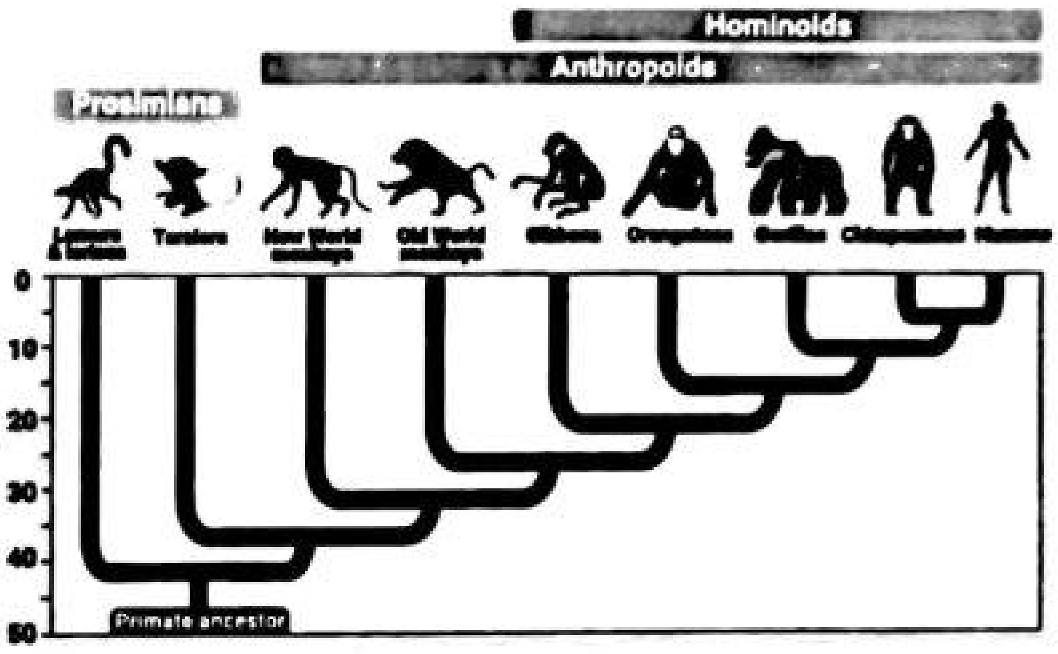
2 Consider the following statements:

I:	Lion, leopard and tiger belong to same genus.
II:	Lion, leopard, tiger and cats belong to same family.
III:	Lion, leopard, tiger, cats and dogs belong to same order.

This implies that:

1.	Cats and dogs are more closely related to each other than cats and leopards
2.	Lions share maximum characteristics with dogs
3.	Lion, leopard and tiger are capable of interbreeding and producing fertile offspring
4.	Lion, leopard, tiger, cats and dogs may belong to the same class in taxonomic hierarchy

3 Look at the given cladogram and select the correct inferences that can be drawn from it:

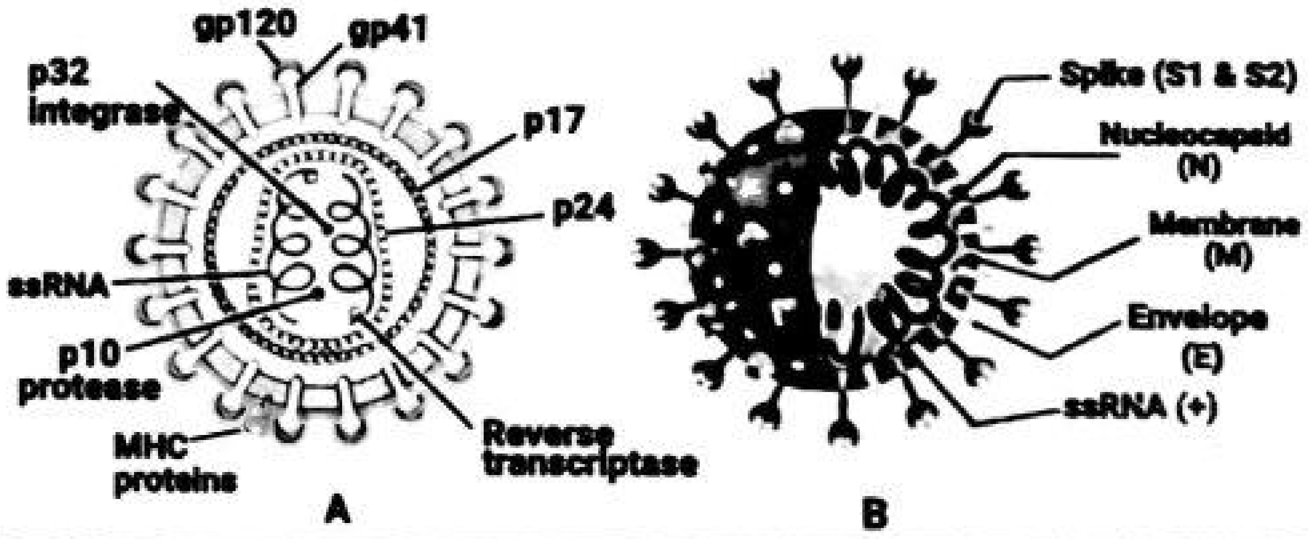

Hominoids
Anthropoids
Prosimians
Lemurs & lorises
Tarsiers
New World monkeys
Old World monkeys
Gibbons
Orangutans
Gorillas
Chimpanzees
Humans
Millions of years ago
0
10
20
30
40
50
Primate ancestor

Inference I:	Man and chimpanzee have a more recent common ancestor than man and gorilla.
Inference II:	New world monkeys turned into old-world monkeys that turned into the great apes.

1. Only Inference I
2. Only Inference II
3. Both Inference I and Inference II
4. Neither Inference I nor Inference II

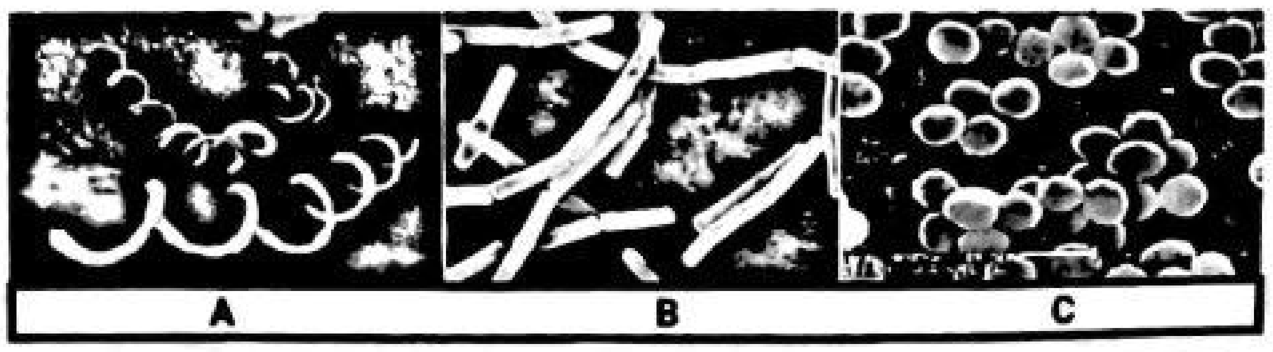
BIOLOGICAL CLASSIFICATION

4 Identify the Viruses A and B in the given diagram:


gp120
gp41
p32 integrase
p17
p24
ssRNA
p10 protease
MHC proteins
Reverse transcriptase
A
Spike (S1 & S2)
Nucleocapsid (N)
Membrane (M)
Envelope (E)
ssRNA (+)
B

	A	B
1.	SarsCoV2	HIV
2.	HIV	SarsCoV2
3.	HSV 1	HSV 2
4.	HBV	HAV

5 Bacteria are of varied shapes. Identify the correct match for A, B and C in the given figure:



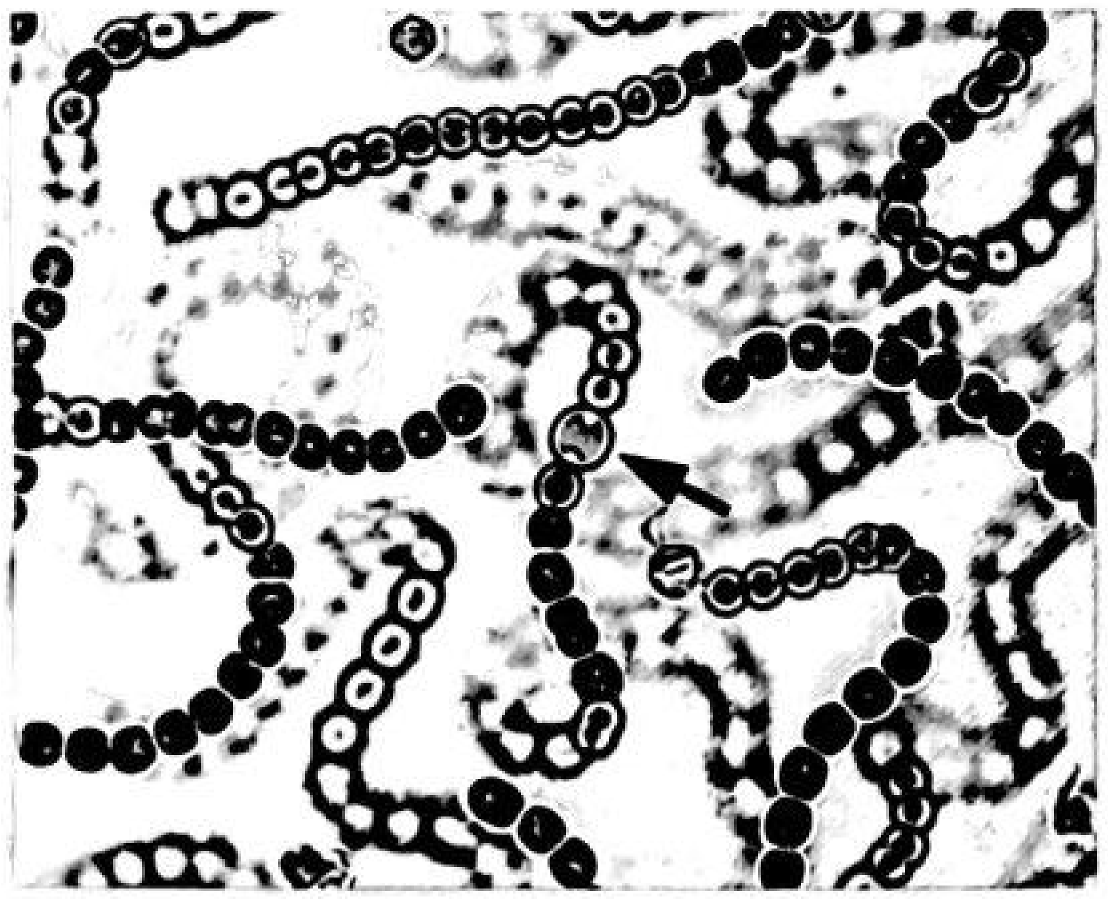
	A	B	C
1.	Spirocheate	Streptobacillus	Staphylococcus
2.	Vibrios	Staphylobacillus	Streptococcus
3.	Vibrios	Streptobacillus	Staphylococcus
4.	Spirochaete	Staphylobacillus	Streptococcus

6 Cyanobacteria:

I:	are eubacteria
II:	have chlorophyll a similar to green plants
III:	can fix atmospheric nitrogen

1. Only **III** is correct
2. Only **I** and **II** are correct
3. Only **II** and **III** are correct
4. **I**, **II** and **III** are correct

7 Identify the correct statement regarding the given figure:



I:	It shows *Nostoc* – a filamentous blue green alga.
II:	The arrow shows specialised cell for fixing atmospheric nitrogen called heterocyst.

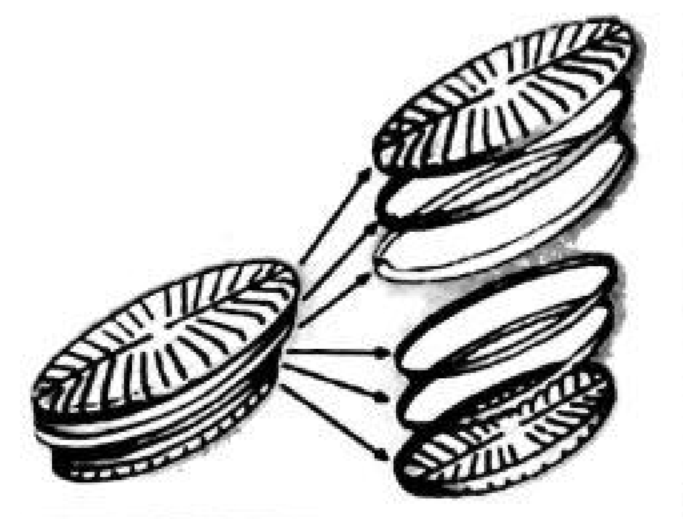
1. **I** is correct but **II** is incorrect
2. **I** is incorrect but **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

8 Protists that do not include any photosynthetic members are:

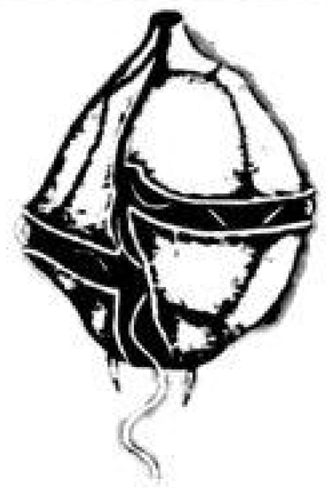
I: Euglenoids	**II:** Slime moulds	**III:** Protozoans

1.	Only **I**	2.	Only **II**
3.	Both **II** and **III**	4.	**I**, **II** and **III**

9 The given figure shows the architecture of the cell wall of:

1. Archaebacteria 2. Gram positive bacteria 3. Diatoms 4. Dinoflagellates	

10 The given figure shows an organism capable of causing ret tides in water bodies that adversely affect the aquatic life. This organism can be:

1. *Ctenoplana* 2. *Gonyaulax* 3. *Pennatula* 4. *Gorgonia*	

11 Match each item in Column I [Protist] with one in Column II [Characteristic] and select the correct option:

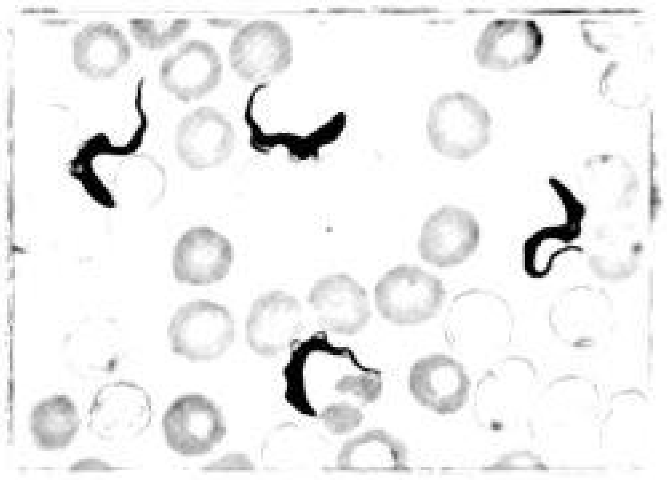
Protist	**Characteristic**
A. Chrysophytes	P. Plasmodium
B. Dinoflagellates	Q. Chief producers in the ocean
C. Euglenoids	R. Stiff cellulose plates in cell wall on outer surface
D. Slime moulds	S. Two flagella, one long and one short

Codes:

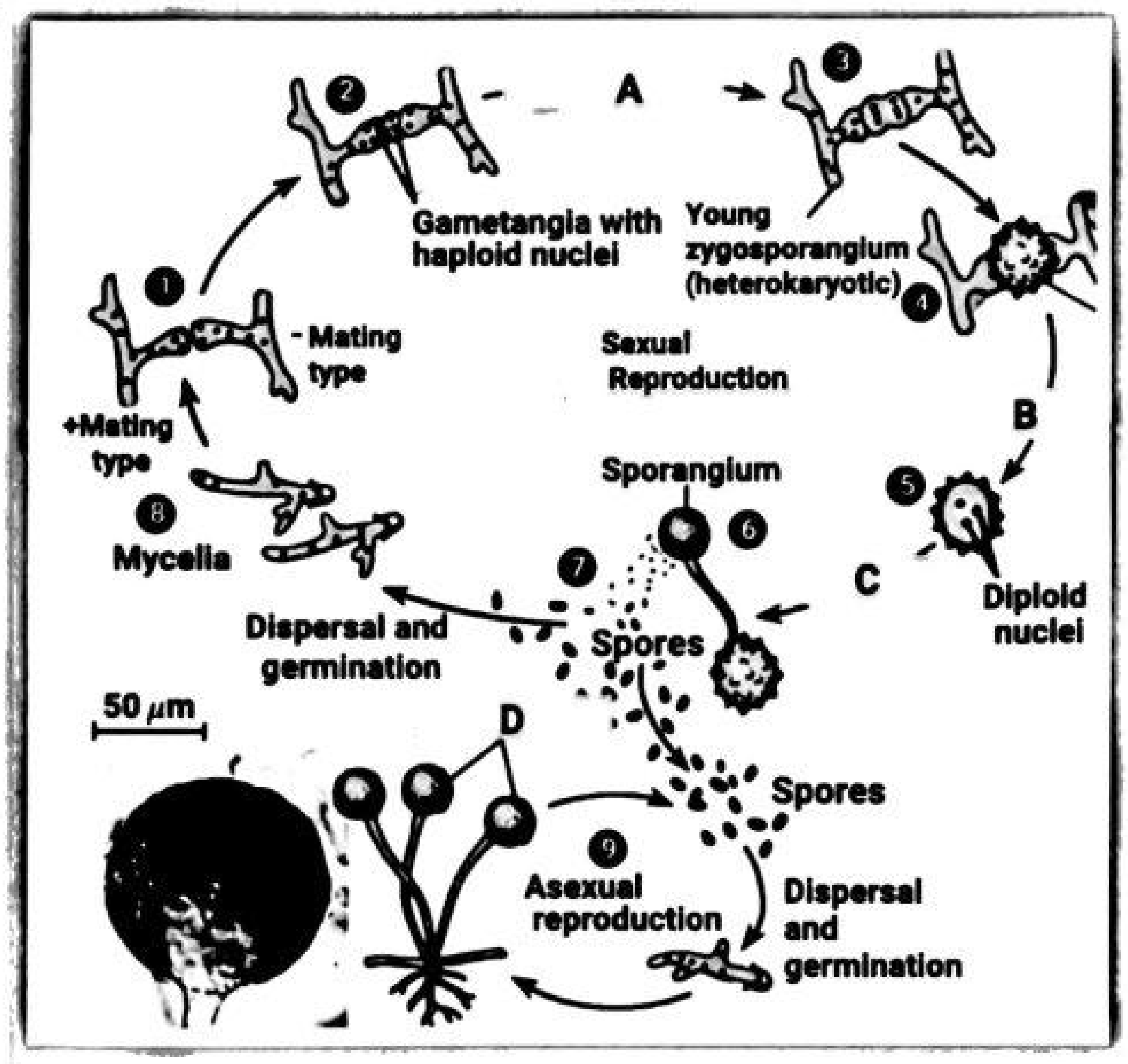
	A	B	C	D
1.	R	Q	S	P
2.	Q	S	P	R
3.	Q	R	S	P
4.	R	S	Q	P

12 What would be true for the pathogen seen in the given slide of peripheral blood from a patient suffering from a certain disease?

I: The pathogen is *Trypanosoma* brucei gambiense.
II: It causes African Sleeping Sickness.
III: It is an amoeboid protozoan.

1. Only **I** and **II** 2. Only **I** and **III** 3. Only **II** and **III** 4. **I, II** and **III**	

13 Given below is a schematic representation of the events in the life cycle of *Rhizopus*. Find the correct match for A-D:


A
③
②
Gametangia with haploid nuclei
Young zygosporangium (heterokaryotic)
④
①
- Mating type
Sexual Reproduction
B
+Mating type
Sporangium
⑤
⑥
⑧
Mycelia
⑦
C
Diploid nuclei
Dispersal and germination
Spores
50 μm
D
Spores
⑨
Asexual reproduction
Dispersal and germination

	A	B	C	D
1.	Plasmogamy	Karyogamy	Meiosis	Sporangia
2.	Karyogamy	Plasmogamy	Meiosis	Sporangia
3.	Plasmogamy	Karyogamy	Mitosis	Conidiophores
4.	Karyogamy	Plasmogamy	Mitosis	Conidiophores

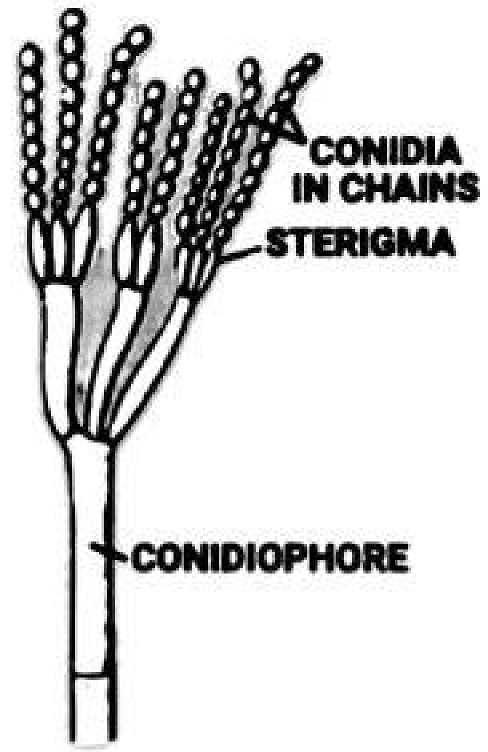
14 Match each item in Column I with one in Column II and choose the correct answer from the codes given:

Column I	Column II
A. *Mucor*	a. Pin mould
B. *Rhizopus*	b. Bread mould
C. *Albugo*	c. White rust
D. *Pythium*	d. Damping-off of seedlings

Codes

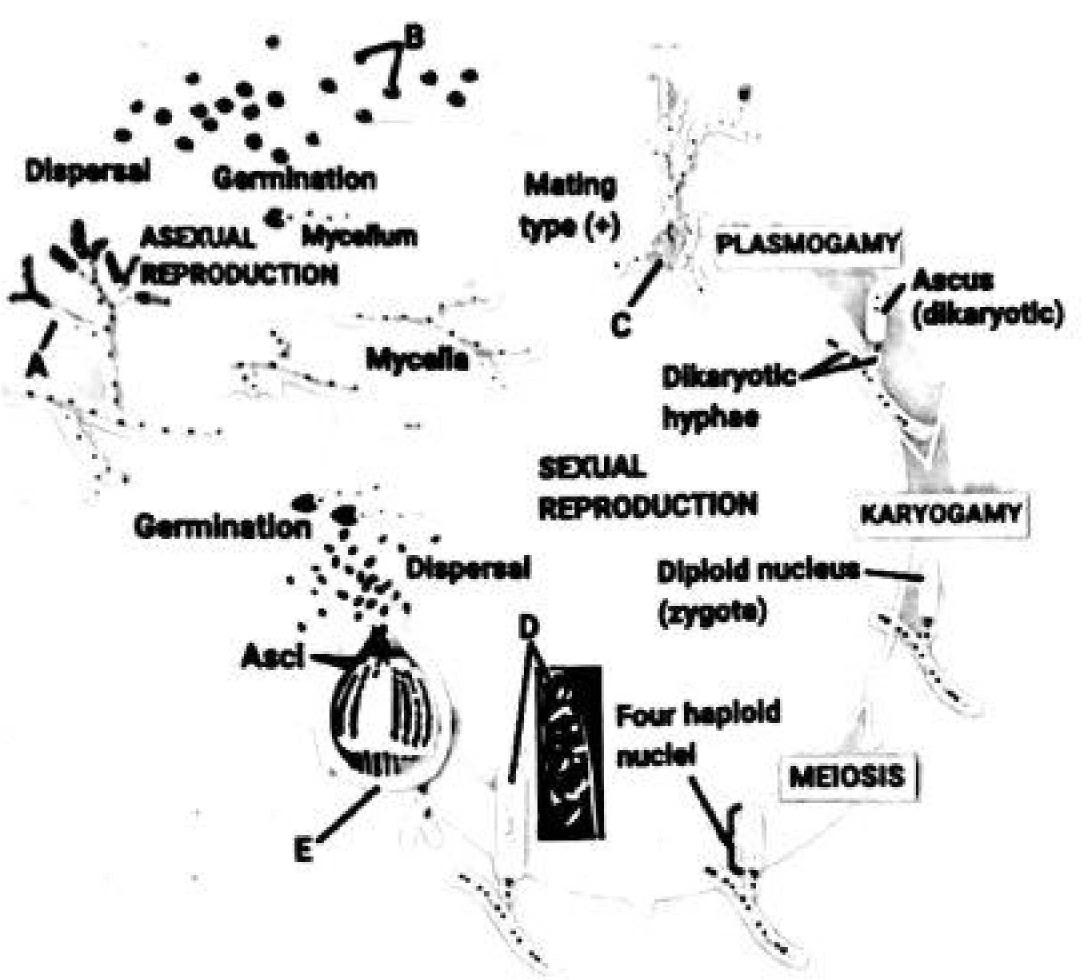
	A	B	C	D
1.	a	b	c	d
2.	b	a	c	d
3.	a	b	d	c
4.	b	a	d	c

15 The fungus shown in the given diagram can be:

1. *Mucor* 2. *Penicillium* 3. *Puccinia* 4. *Ustilago*	

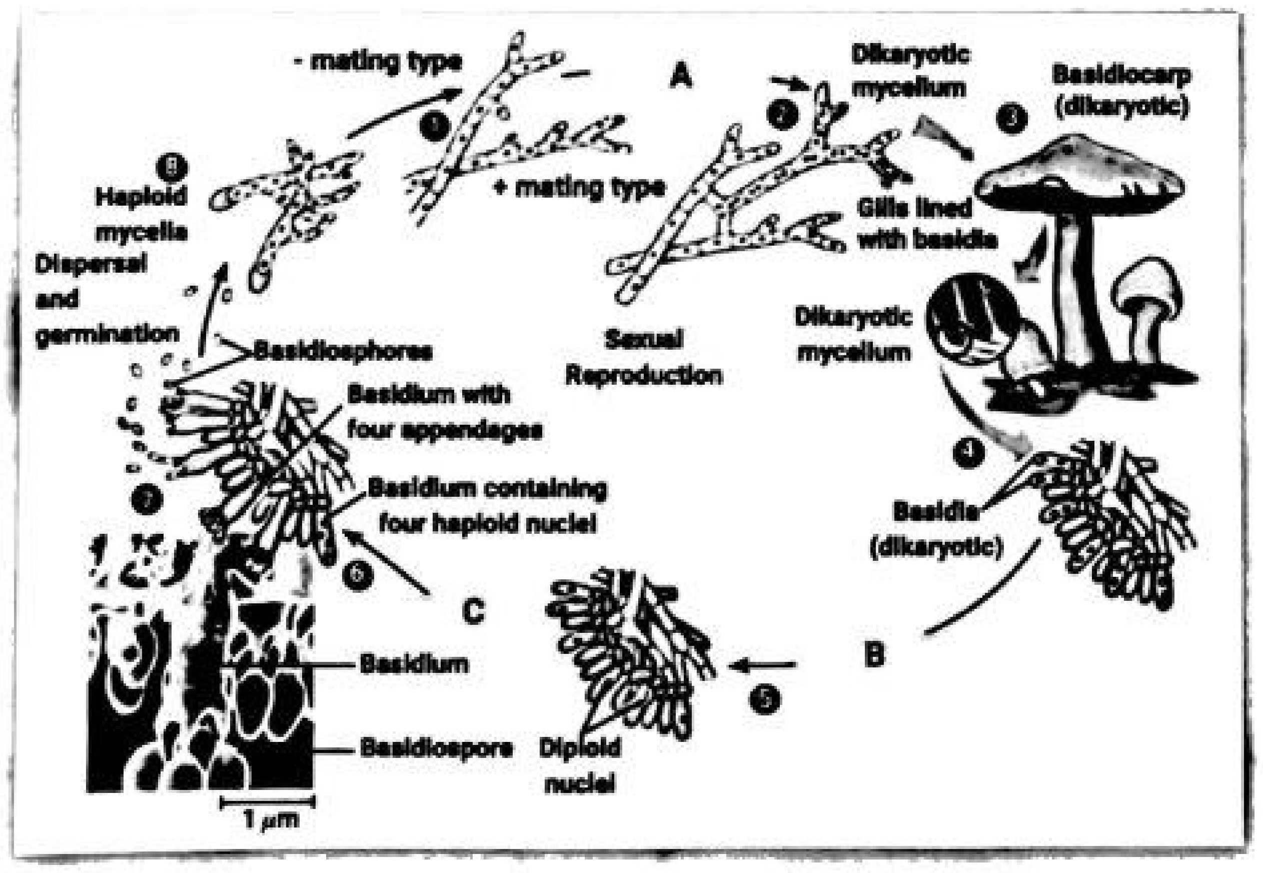
CONIDIA IN CHAINS
STERIGMA
CONIDIOPHORE

16 Given below is a schematic representation of the events in the life cycle of a fungus belonging to Ascomycetes. Identify A-E:


B
Dispersal
Germination
ASEXUAL REPRODUCTION
Mycelium
Mating type (+)
PLASMOGAMY
C
Ascus (dikaryotic)
A
Mycelia
Dikaryotic hyphae
SEXUAL REPRODUCTION
KARYOGAMY
Germination
Dispersal
Diploid nucleus (zygote)
D
Asci
Four haploid nuclei
MEIOSIS
E

1.	A: Sporangiophore B: Sporangia C: Ascocarp D: 4 Ascospores E: Ascogonium	2.	A: Sporangiophore B: Sporangia C: Ascocarp D: 8 Ascospores E: Ascogonium
3.	A: Conidiophore B: Conidia C: Ascogonium D: 4 Ascospores E: Ascocarp	4.	A: Conidiophore B: Conidia C: Ascogonium D: 8 Ascospores E: Ascocarp

17 Given below is a schematic representation of the events in the life cycle of a fungus belonging to Basidiomycetes. Identify the correct statements:


- mating type
A
Dikaryotic mycelium
Basidiocarp (dikaryotic)
Haploid mycelia
+ mating type
Gills lined with basidia
Dispersal and germination
Basidiosphores
Sexual Reproduction
Dikaryotic mycelium
Basidium with four appendages
Basidium containing four haploid nuclei
Basidia (dikaryotic)
C
B
Basidium
Basidiospore
Diploid nuclei
1 μm

Statement I:	A is karyogamy; B is plasmogamy and C is meiosis.
Statement II:	Though not shown in the figure the fungi belonging to this class reproduced extensively by asexual methods involving conidia.

1. **Statement I** is correct but **Statement II** is incorrect
2. **Statement I** is incorrect but **Statement II** is correct
3. Both **Statement I** and **Statement II** are correct
4. Both **Statement I** and **Statement II** are incorrect

18 Ascomycetes and Basidiomycetes have many homologies. All the following will be true but:

1.	Binucleate ascogenous hyphae of ascomyctes and binucleate secondary hyphae of basidiomycetes
2.	Ascospore and basidiospore
3.	Hook and crosier method in ascomycetes and clamp connection in basidiomycetes
4.	Conidia in ascomycetes and basidiomycetes

19 Match the fungi [Column I] with the Class to which it belongs [Column II] and select the correct answer from the codes given:

	Column I		Column II
A.	*Ustilago tritici*	P.	Phycomycetes
B.	*Albugo candida*	Q.	Ascomycetes
C.	*Alternaria solani*	R.	Basidiomycetes
D.	*Claviceps purpurea*	S.	Deuteromycetes

Codes

	A	B	C	D
1.	R	P	S	Q
2.	Q	P	S	R
3.	R	S	P	Q
4.	Q	S	P	R

20 Match the class of fungi in Column I with representative examples in Column II and select the correct option:

	Column I		Column II
A.	Phycomycetes	P.	Morels and truffles
B.	Ascomycetes	Q.	*Alternaria, Trichoderma*
C.	Basidiomycetes	R.	Bread mould and *Albugo*
D.	Deuteromycetes	S.	Smut and rust fungi

Codes:

	A	B	C	D
1.	P	R	S	Q
2.	R	S	P	Q
3.	P	Q	R	S
4.	R	P	S	Q

21 You discover a new fungus. On careful examination you find that the mycelium is septate and branched, they reproduce asexually by conidia and you cannot identify any sexual stage in its life cycle. To which fungal class would you place this fungus?

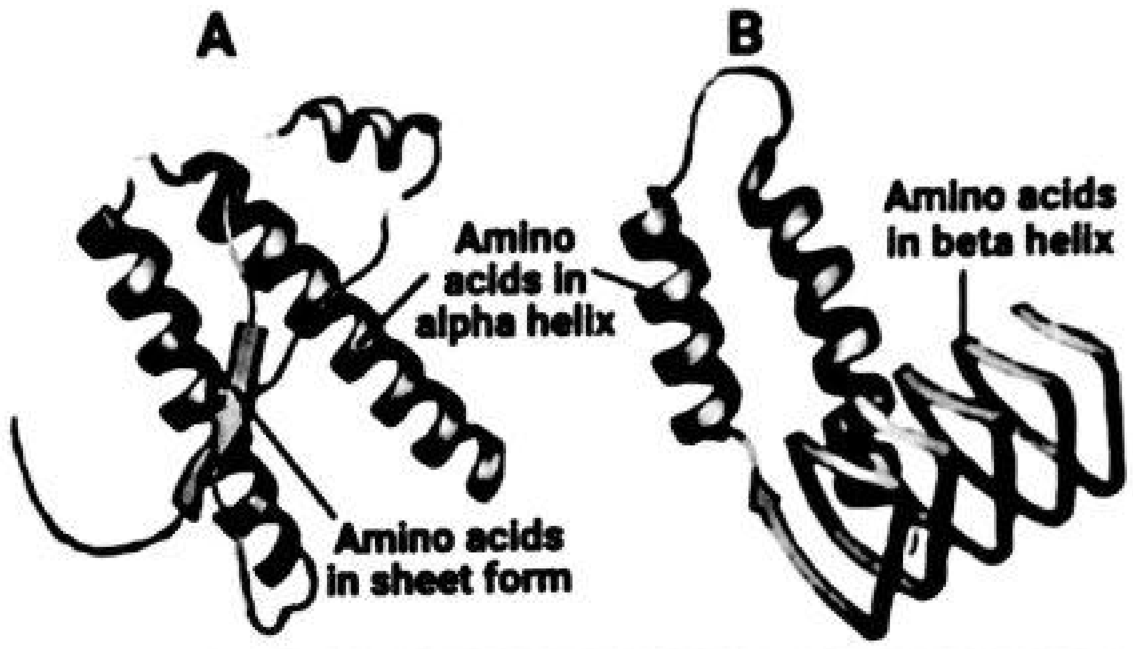
1. Phycomycetes	2. Ascomycetes
3. Basidiomycetes	4. Deuteromycetes

22 The figure shows potato affected by certain disease. The affected plants are stunted, tubers may be small, elongated, cylindrical, spindle or dumb-bell-shaped, with prominent eyes evenly distributed over the tuber, and cracking. What will be true for the given figure?

I:	The disease is Potato Spindle Tuber Disease.
II:	It is caused by a pathogen that is high molecular weight double stranded RNA.

1.	Only I	2.	Only II
3.	Both I and II	4.	Neither I nor II

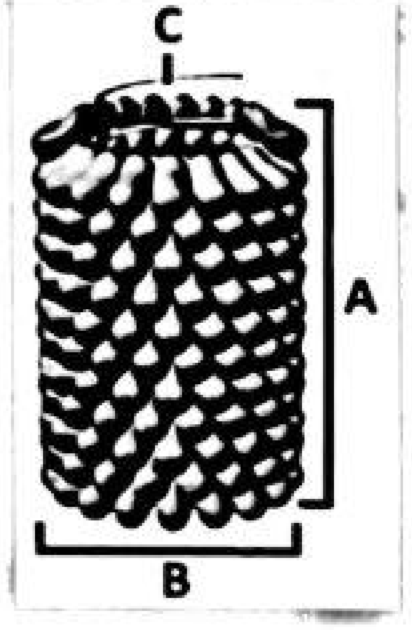
23 The given figure shows: a normally folded protein [A] and a misfolded protein [B]. What will be correct?


A
B
Amino acids in alpha helix
Amino acids in beta helix
Amino acids in sheet form

I:	Prions are misfolded proteins that have the ability to transmit their misfolded shape onto normal variants of the same protein.
II:	Prions cause scrapie in sheep, bovine spongiform encephalopathy (BSE) in cattle (commonly known as "mad cow disease") and Creutzfeldt–Jakob disease (CJD) in humans.

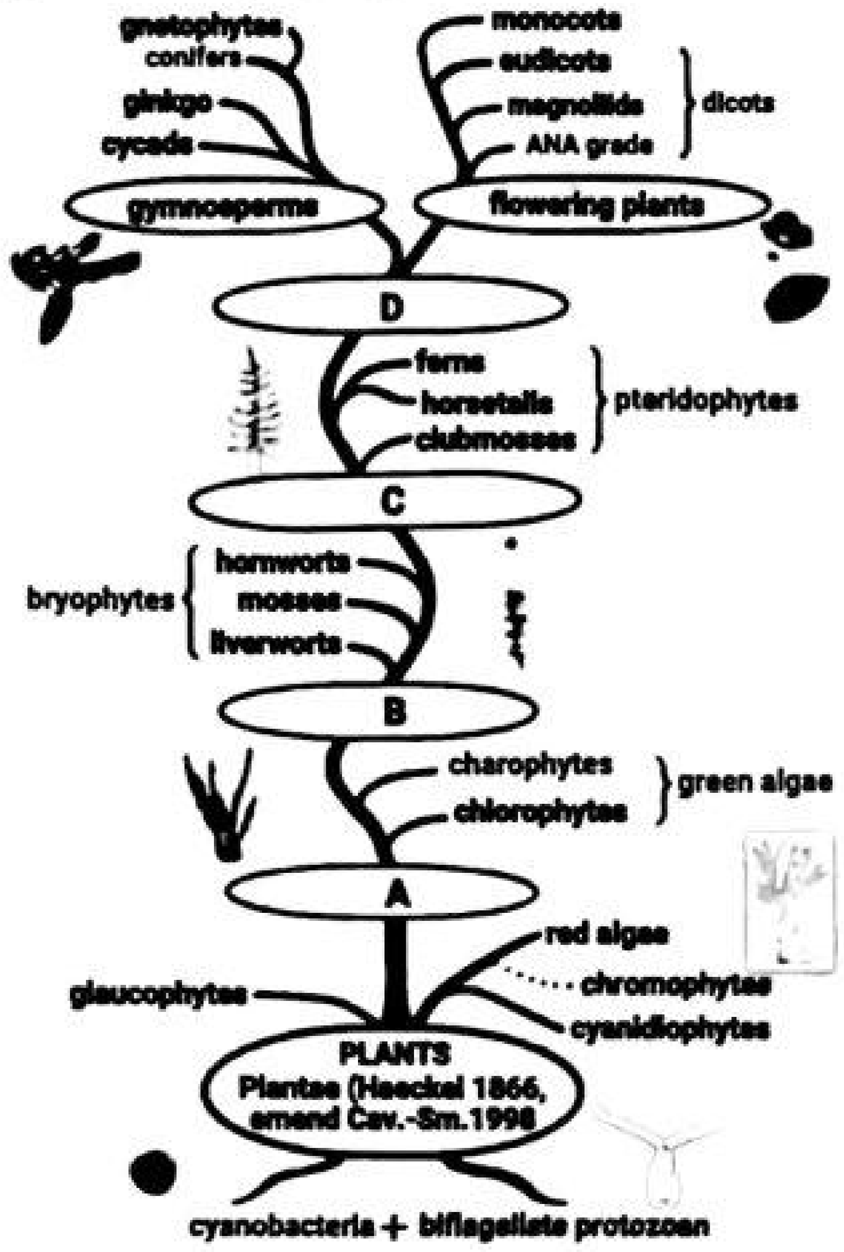
1.	Only I	2.	Only II
3.	Both I and II	4.	Neither I nor II

24 Given diagram shows the structure of Tobacco Mosaic Virus. Identify the correct match for A, B and C.

	A	B	C	
1.	300 nm	18 nm	Single stranded RNA	
2.	18 nm	4 nm	Single stranded DNA	
3.	300 nm	18 nm	Double stranded RNA	
4.	18 nm	4 nm	Double stranded DNA	

PLANT KINGDOM

25 The given figure shows the phylogenetic evolution of plants with A, B, C and D representing common ancestors in the lineage. Identify A, B, C and D:


gnetophytes
conifers
ginkgo
cycads
monocots
eudicots
magnoliids
ANA grade
dicots
gymnosperms
flowering plants
D
ferns
horsetails
clubmosses
pteridophytes
C
bryophytes
hornworts
mosses
liverworts
B
charophytes
chlorophytes
green algae
A
red algae
glaucophytes
chromophytes
cyanidiophytes
PLANTS
Plantae (Haeckel 1866, emend Cav.-Sm.1998
cyanobacteria + biflagellate protozoan

	A	B	C	D
1.	Vascular plants	Seed plants	Green plants	Land plants
2.	Land plants	Green plants	Seed plants	Vascular plants
3.	Green plants	Land plants	Vascular plants	Seed plants
4.	Seed plants	Vascular plants	Land plants	Green plants

26 Cyanobacteria are classified under

1. Protista	2. Plantae
3. Monera	4. Algae

27 The earliest land plants lacked true roots. What may have enabled them the most to colonize land?

1.	Symbiotic associations with fungi
2.	Prostrate thalloid body
3.	Motile antherozoids capable of reaching the egg through water
4.	Parasitic and saprophytic modes of nutrition

28 Aplanogametes [gametes that do not have flagella] are the special features of:

1. *Spirogyra* and *Zygnema*
2. *Spirogyra* and *Vaucheria*
3. *Ulothrix* and *Zygnema*
4. *Chlamydomanas* and *Ulothrix*

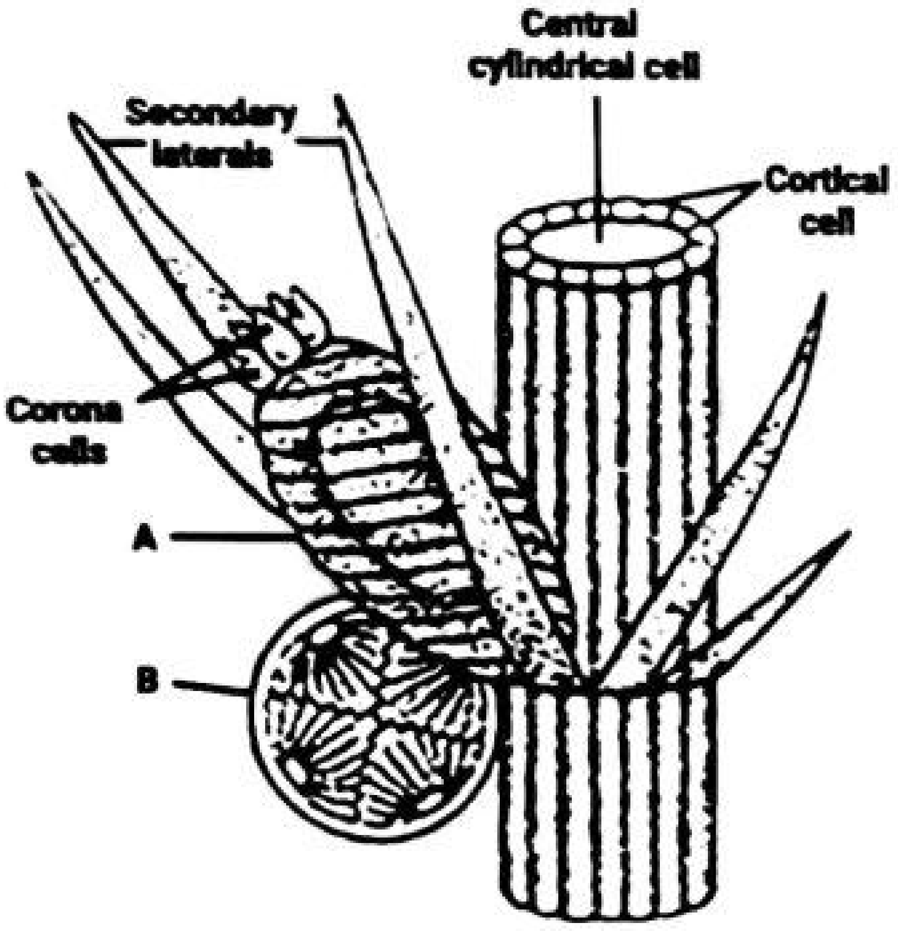
29 Match each item in column I with one in Column II and select the correct answer from the codes given below:

Green alga	Feature
A. *Chlamydomanas*	a. Spiral chloroplasts
B. *Volvox*	b. Coenobium with two kinds of cells
C. *Hydrodictyon*	c. Palmella stage
D. *Spirogyra*	d. Non motile colony

Codes:

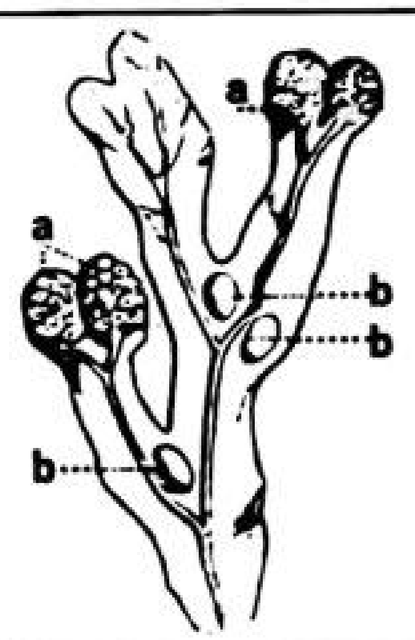
	A	B	C	D
1.	a	d	b	c
2.	a	b	c	d
3.	c	b	a	d
4.	c	d	a	b

30 In the given diagram of the green alga *Chara*, the parts labeled A and B respectively are called :



1. Nucule and Globule
2. Globule and Nucule
3. Antheridium and Archegonium
4. Archegonium and Antheridium

31 The structure marked as "b" can be used for:

1. Photosynthesis 2. Attachment 3. Buoyancy 4. Reproduction	

32 Match each item in Column I with one in Column II and select the correct answer from the codes given:

Column I	Column II
A. Floridean starch	a. It is created by photosynthesis and is made up of $\beta(1\rightarrow3)$-glucan with $\beta(1\rightarrow6)$-branches
B. Laminarin	b. An α-linked glucose polymer with a degree of branching intermediate between amylopectin and glycogen
C. Mannitol	c. A sugar alcohol, an isomer of sorbitol

Codes

	A	B	C
1.	a	b	c
2.	a	c	b
3.	b	a	c
4.	c	b	a

33 The term 'seaweeds' is used to describe several macroscopic, multicellular marine algal species belonging to:

I. Chlorophyceae
II. Phaeophyceae
III. Rhodophyceae

1.	I and II only	2.	I and III only
3.	II and III only	4.	I, II and III

34 Red algae photosynthesize at ocean depths greater than any other group of algae and hence can be found in deepest waters because they

1.	contain a higher concentration of chlorophyll
2.	have an extremely large surface area to capture the little amount of light that reaches them
3.	contain the pigment phycoerythrin
4.	periodically float to the surface and intercept light, then move back to the ocean floor

35 How many of the given features will be true for brown algae:

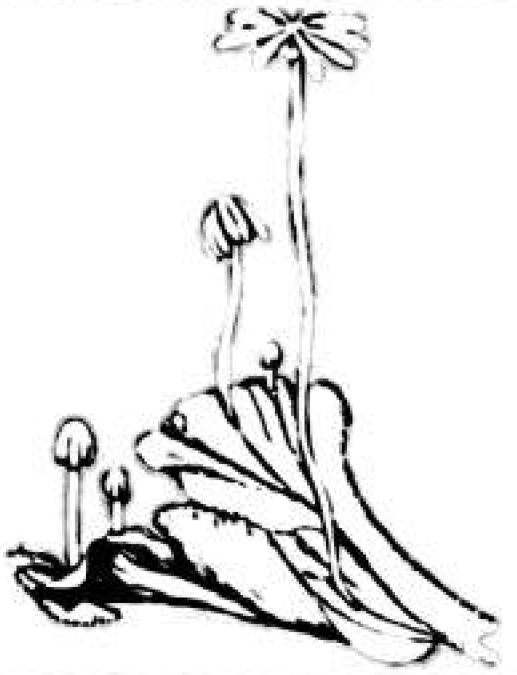
I. Presence of xanthophylls
II. A gelatinous coating of algin on cell wall
III. A centrally placed vacuole in plastids
IV. Ribbon shaped biflagellate zoospores

1.	1	2.	2
3.	3	4.	4

36 Identify the correct statement regarding *Marchantia*:

1.	Multicellular rhizoids help in anchorage and absorption of water through their capillary action.
2.	Reproductive organs are borne on antheridiophores and archegoniophores that arise from the apical notches of male and female thalli respectively.
3.	The antheridiophore has an umbrella shaped structure which bears antheridia.
4.	The archegoniophores have flattened, more or less convex head or receptacle.

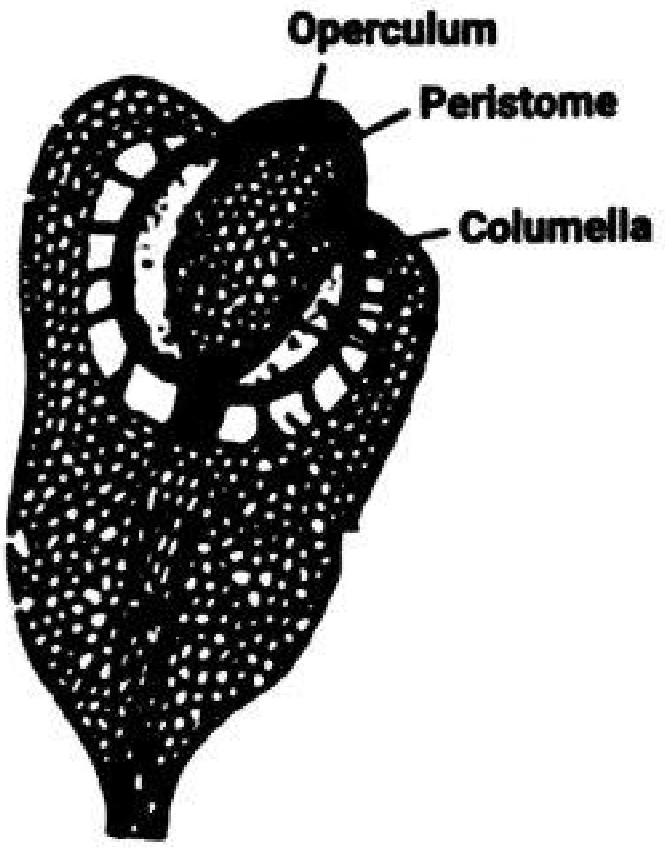
37 The given diagram shows:

1. Male thallus of *Marchantia* 2. Female thallus of *Marchantia* 3. *Sphagnum* sporophyte 4. *Sphagnum* gametophyte	

38 Identify the incorrectly matched comparison between liverworts and mosses:

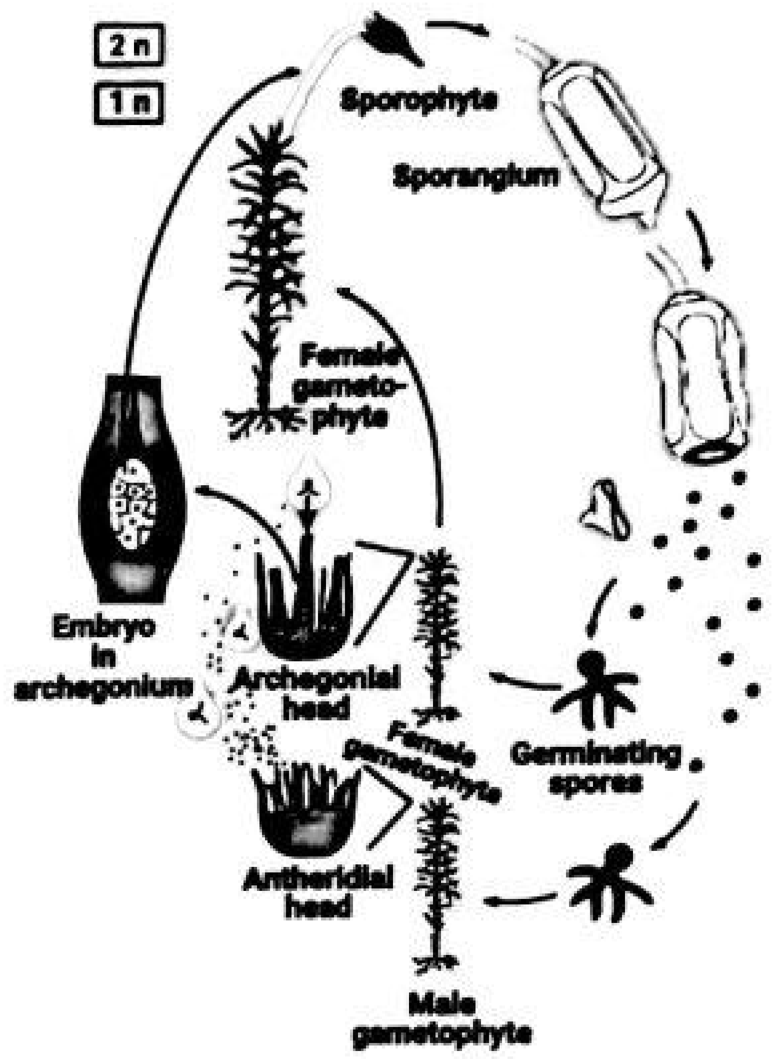
	Character	Liverworts	Mosses
1.	Gametophyte	Thalloid and dorsiventral	Leafy and radial
2.	Rhizoids	Unicellular, mostly unbranched	Multicellular, generally branched
3.	Protonema	Mostly absent or small	Distinct and well developed
4.	Elaters	Absent	Present

39 The given structure belongs to:


Operculum
Peristome
Columella

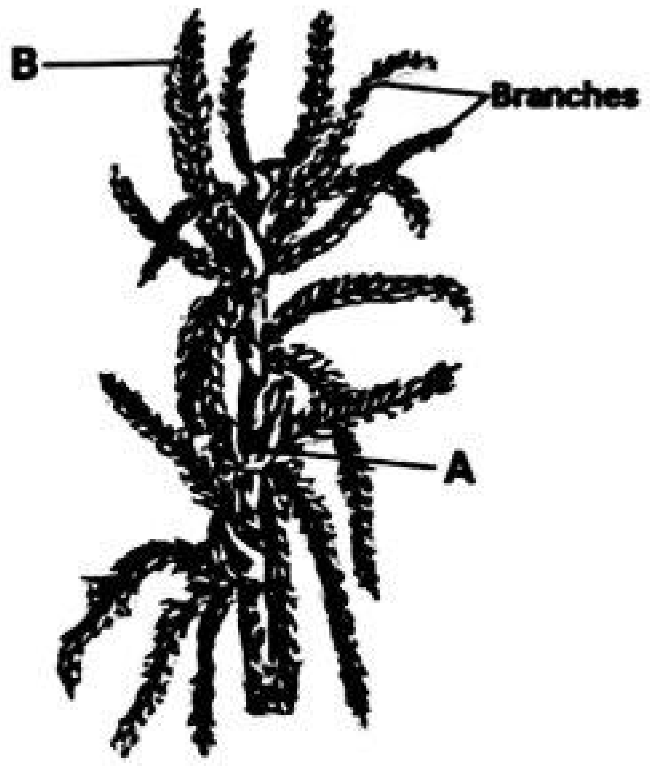
1. the gametophytic generation in the life cycle of a fern
2. the sporophytic generation in the life cycle of a fern
3. the gametophytic generation in the life cycle of a moss
4. the sporophytic generation in the life cycle of a moss

40 The given figure represents the life cycle of a typical:


2n
1n
Sporophyte
Sporangium
Female gametophyte
Embryo in archegonium
Archegonial head
Female gametophyte
Germinating spores
Antheridial head
Male gametophyte

1.	Gymnosperm	2.	Angiosperm
3.	Bryophyte	4.	Pteridophyte

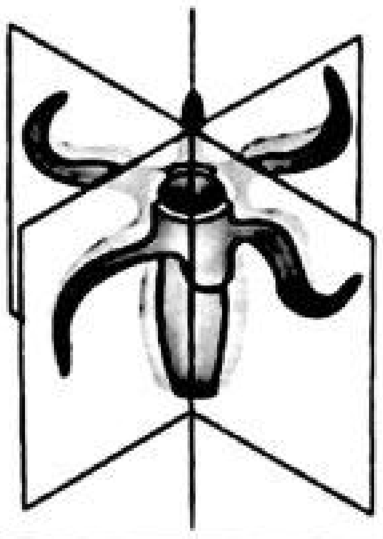
41 The given figure represents:


B
Branches
A

1.	*Equisetum*, a horsetail where A is macrophyll and B is microphyll
2.	*Sphagnum*, peat moss where A is microphyll and B is macrophyll
3.	*Equisetum*, a horsetail where A is archegonial branch and B is antheridial branch
4.	*Sphagnum*, peat moss where A is archegonial branch and B is antheridial branch

ANIMAL KINGDOM

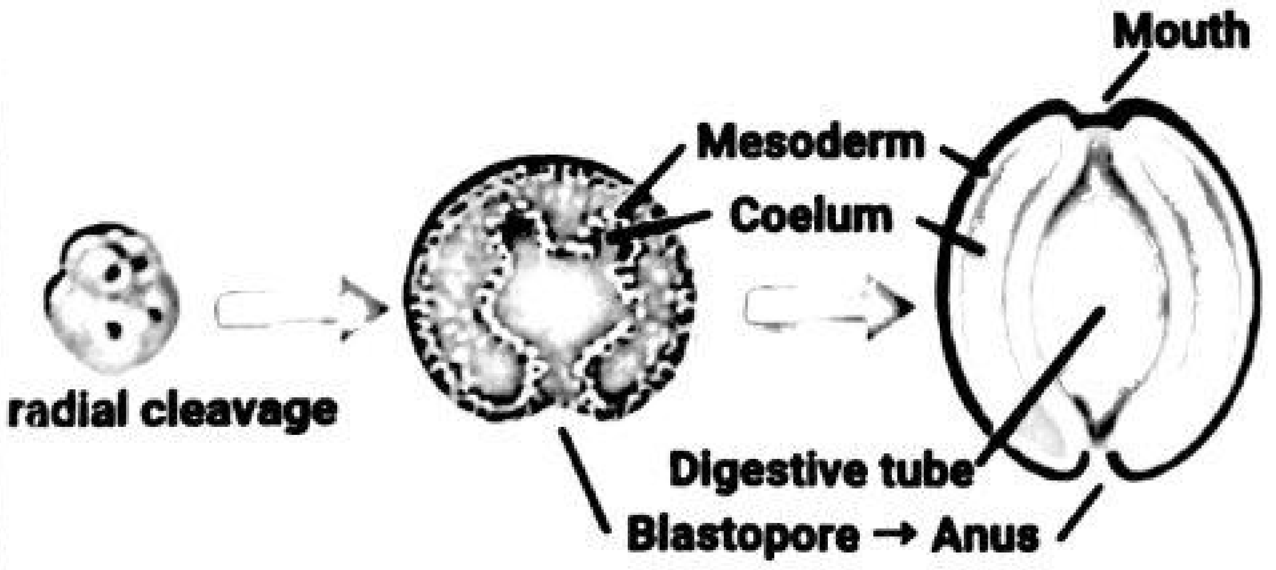
42 What would be true for an animal that exhibits the kind of body symmetry shown in the given diagram?



I:	This is seen in sponges, cnidarians, ctenophores and larval echinoderms.
II:	This type of body symmetry is generally seen in animals which move actively in their environment.

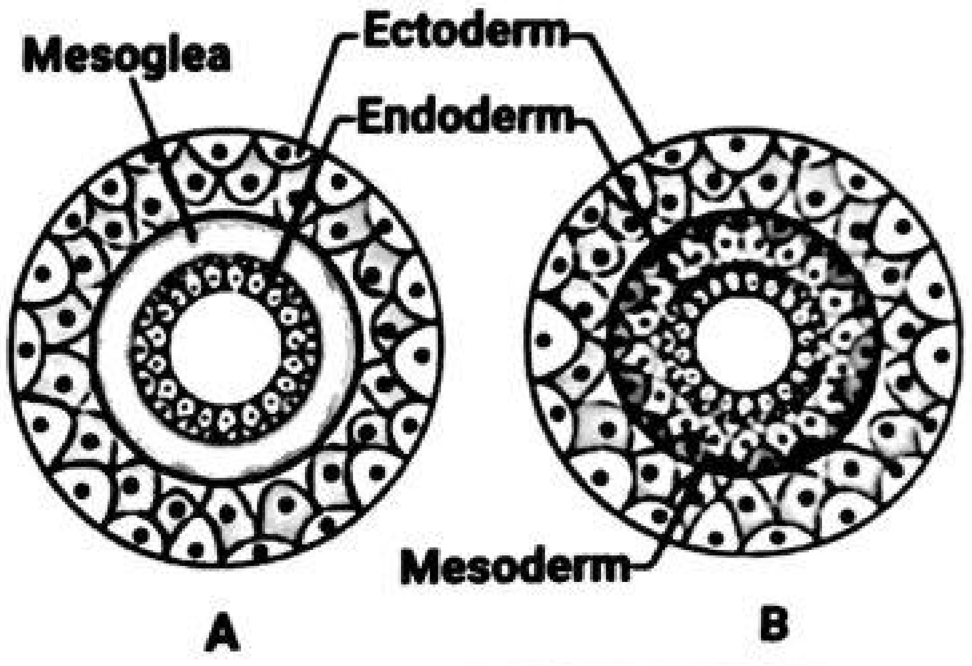
1.	Only I	2.	Only II
3.	Both I and II	4.	Neither I nor II

43 Animals with the type of embryonic development shown in the given diagram are:



1. Holometabolous
2. Paurometabolous
3. Protostomes
4. Dueterostomes

44 Which of the following will be true for both animals with body plan A and B as shown in the given figure?



1.	Body will be bilaterally symmetrical
2.	Muscle will be well developed
3.	A true coelom will be present
4.	Both will have cells organized into tissues and heterotrophic nutrition

45 Consider the two statements:

I:	Metamerism in animals is same as segmentation.
II:	Both result in serial repetition of unit subdivisions of ectoderm and mesoderm products.

1. Both I and II are correct and II explains I
2. Both I and II are correct but II does not explain I
3. Only I is correct
4. Both I and II are incorrect

46 Consider the two statements:

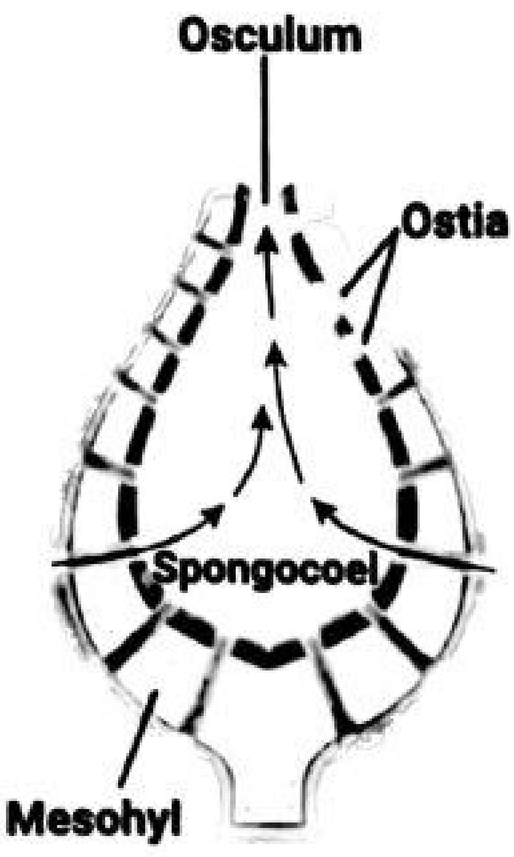
I:	The development of an AP axis in animals with bilateral symmetry is important in locomotion.
II:	Bilateral symmetry gives the body an intrinsic direction and allows streamlining to reduce drag.

1. Both I and II are correct and II explains I
2. Both I and II are correct but II does not explain I
3. Only I is correct
4. Both I and II are incorrect

47 Body having meshwork of cell, internal cavities lined with food filtering flagellated cells and indirect development are the characteristics of phylum:

1.	Porifera	2.	Mollusca
3.	Protozoa	4.	Coelenterate

48 Consider the given two statements regarding the water flow through the bodies of sponges as shown in the diagram.


Osculum
Ostia
Spongocoel
Mesohyl

I:	Most sponges work rather like chimneys: they take in water at the bottom and eject it from the osculum ("little mouth") at the top.
II:	The inner surface is covered with choanocytes where the wave-like motion of the whip-like flagella drives water through the sponge's body.

1. I is correct and II is incorrect.
2. I is incorrect and II is correct.
3. I is correct and II is also correct.
4. I is incorrect and II is also incorrect.

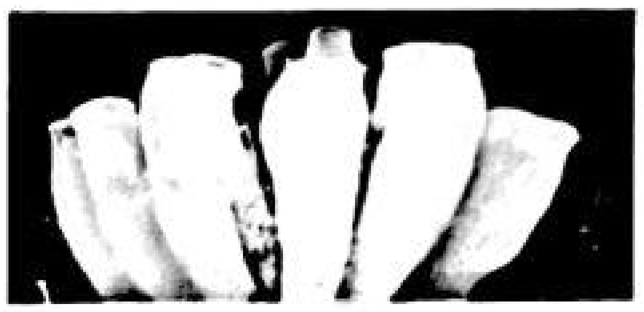
49 Match each item in Column I with one in Column II and select the correct match from the codes given:

	Column I		Column II
A.	*Spongilla*	P.	Sea-fan
B.	*Euspongia*	Q.	Brain coral
C.	*Gorgonia*	R.	Fresh Water sponge
D.	*Meandrina*	S.	Sea-pen
E.	*Pennatula*	T.	Bath sponge

Codes:

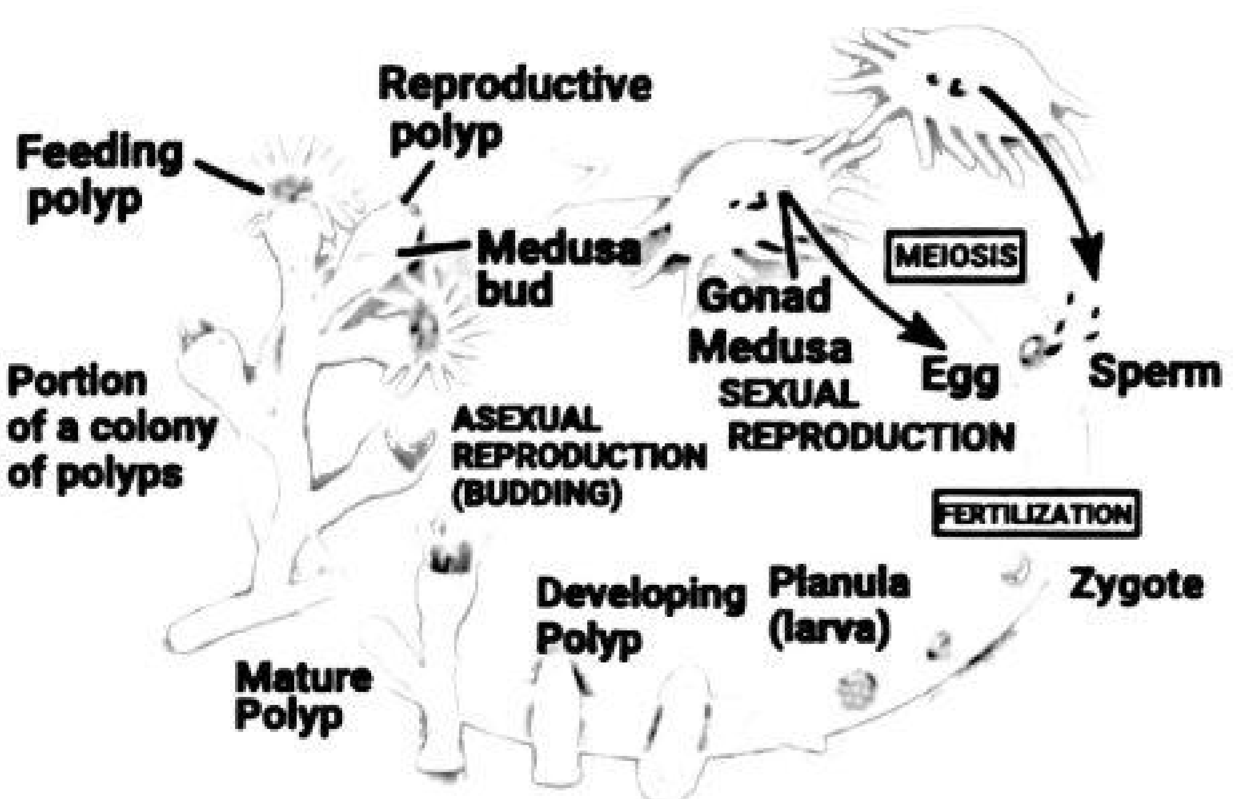
	A	B	C	D	E
1.	T	R	P	Q	S
2.	R	T	P	Q	S
3.	T	R	Q	S	P
4.	R	T	S	P	Q

50 *Euplectella* [Venus Flower Basket], shown in the figure below, belongs to:



1.	Porifera	2.	Cnidaria
3.	Ctenophora	4.	Platyhelminthes

51 Given below is the schematic representation of the life cycle of *Obelia*, a cindarian. Consider the given two statements:


Reproductive polyp
Feeding polyp
Medusa bud
Gonad
MEIOSIS
Medusa
Egg
Sperm
Portion of a colony of polyps
ASEXUAL REPRODUCTION (BUDDING)
SEXUAL REPRODUCTION
FERTILIZATION
Developing Polyp
Planula (larva)
Zygote
Mature Polyp

I:	This type of life cycle is called as metagenesis and it is a sort of alternation of generation.
II:	Polyps in the life cycle of cnidarians are haploid and medusae are diploid.

1. Both I and II are correct and II explains I
2. Both I and II are correct but II does not explain I
3. I is correct and II is incorrect
4. I is incorrect and II is correct

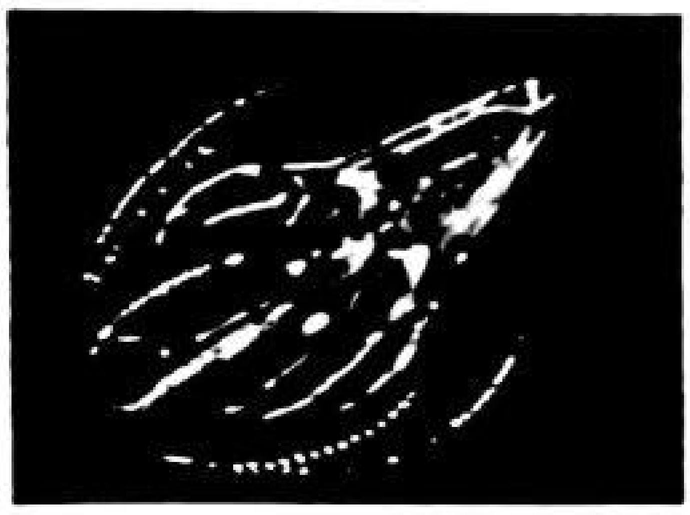
52 Biradial symmetry is most obvious in:

1.	Cnidarians	2.	Ctenophores
3.	Nematodes	4.	Echinoderms

53 The diagram shows an organism with the following features:

I. Presence of comb plates on the surface.

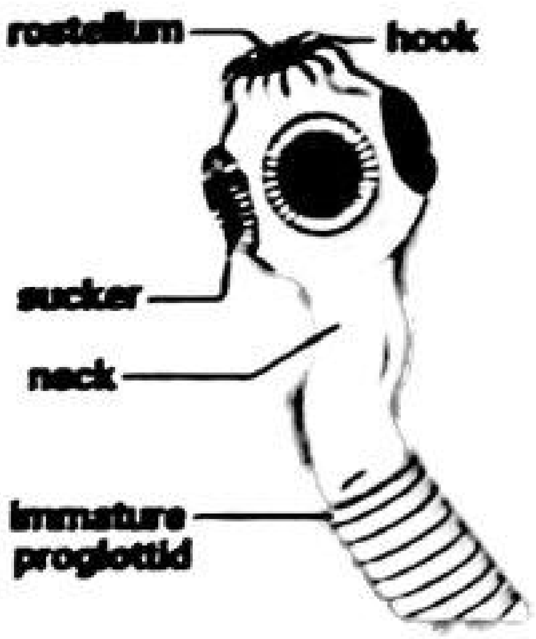
II. Bioluminescence



This animal can be:

1. A sponge	2. A Cnidarian
3. A Ctenophore	4. A flatworm

54 The following structure is most likely:



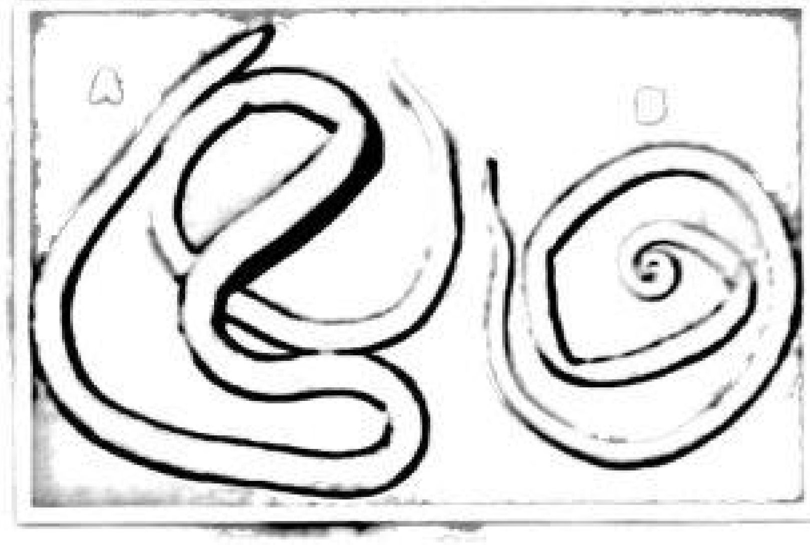
1. An attachment organ at the anterior end of tapeworms.
2. Sensory apparatus at the anterior end of nematodes.
3. The multiple compound eyes seen in aquatic helminths.
4. Food storage organ in parasitic platyhelminths.

55 Consider the two statements:

I:	Platyhelminthes are restricted to environments where dehydration is unlikely.
II:	They are dorso-ventrally flattened.

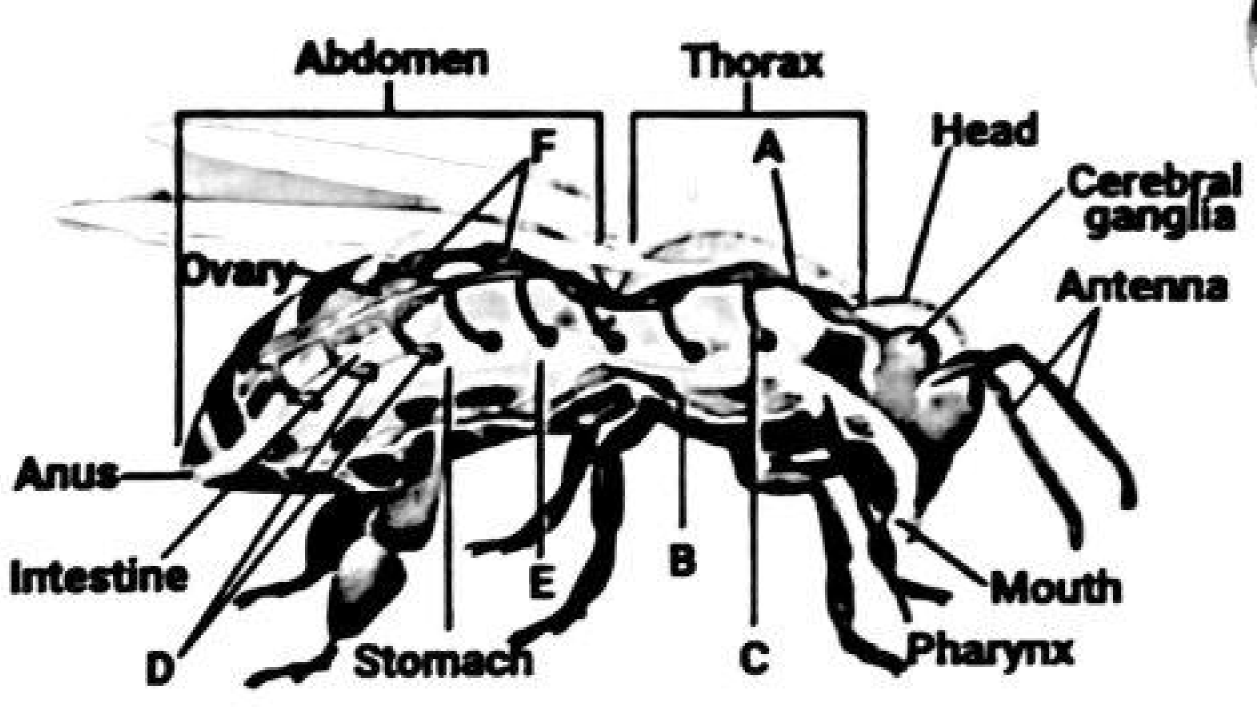
1. Both I and II are correct and II explains I
2. Both I and II are correct but II does not explain I
3. Only I is correct
4. Both I and II are incorrect

56 Given below is a figure showing the worms which are the most common cause of helminthic infestation in the world.



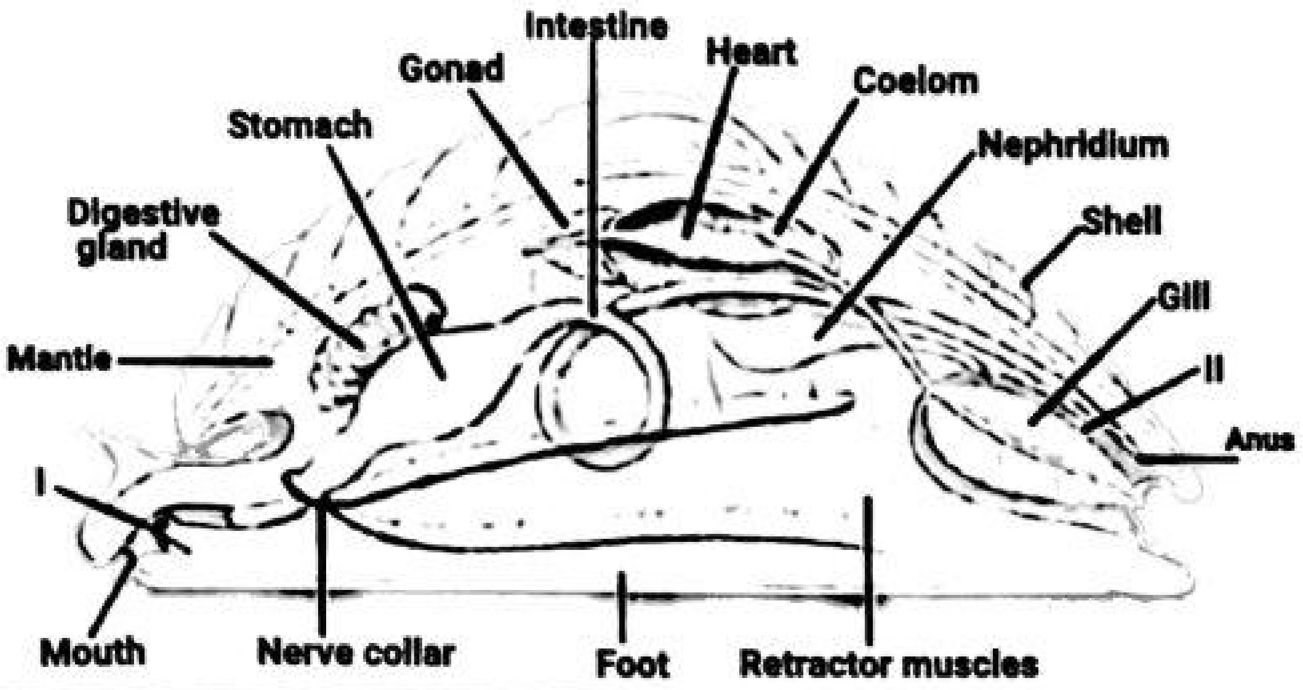
1. A is male *Ascaris* and B is female *Ascaris*
2. A is female *Ascaris* and B is male *Ascaris*
3. A is male *Wuchereria* and B is female *Wuchereria*
4. A is female *Wuchereria* and B is male *Wuchereria*

57 In the given diagram of the body plan of an insect, identify the parts A-F:



	A	B	C	D	E	F
1.	Blood vessel	Nerve cord	Trachea	Spiracles	Crop	Hearts
2.	Blood vessel	Nerve cord	Trachea	Spiracles	Oesophagus	Hearts
3.	Nerve cord	Blood vessel	Trachea	Spiracles	Crop	Ostia
4.	Nerve cord	Blood vessel	Stomo-chord	Ostia	Oesophagus	Spiracles

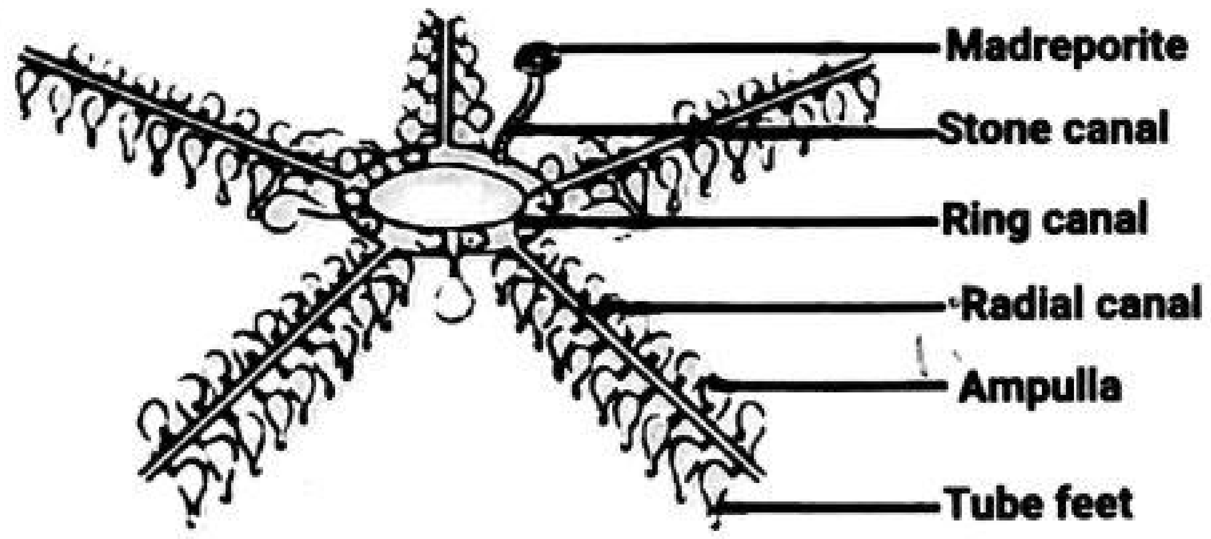
58 Given below is the body plan of a hypothetical generalized mollusc. Consider the given two statements.


Intestine
Gonad
Heart
Coelom
Stomach
Nephridium
Digestive gland
Shell
Gill
Mantle
II
Anus
I
Mouth
Nerve collar
Foot
Retractor muscles

A:	I is found in all the molluscs.
B:	II is a cavity used for egestion, excretion and respiration.

1. Only I is correct
2. Only II is correct
3. Both I and II are correct
4. Both I and II are incorrect

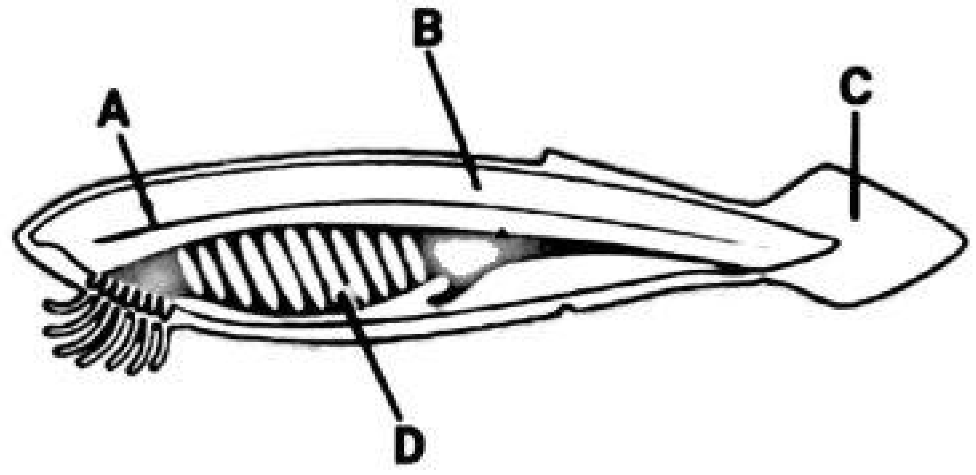
59 Given below is a diagram showing the water vascular system of an Echinoderm.


Madreporite
Stone canal
Ring canal
Radial canal
Ampulla
Tube feet

I:	It is a hydraulic system used by echinoderms for locomotion, food and waste transportation, and respiration.
II:	The system is composed of canals connecting numerous tube feet.

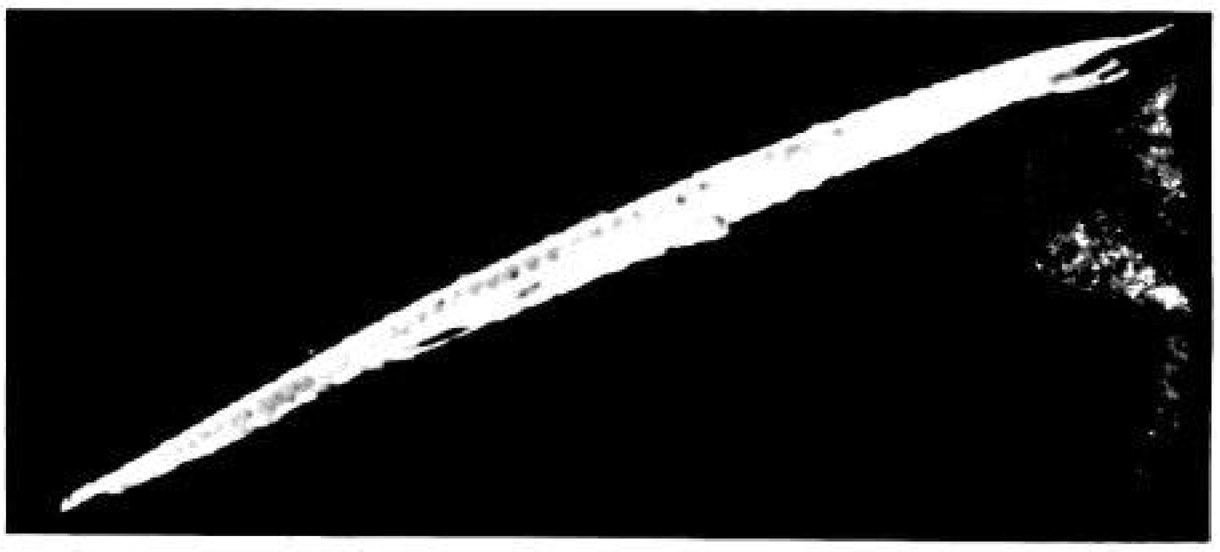
1. Only I is correct
2. Only II is correct
3. Both I and II are correct
4. Both I and II are incorrect

60 Though all four features shown in the diagram of a generalized chordate appear at some point during development, they are actually named for:



1.	A	2.	B
3.	C	4.	D

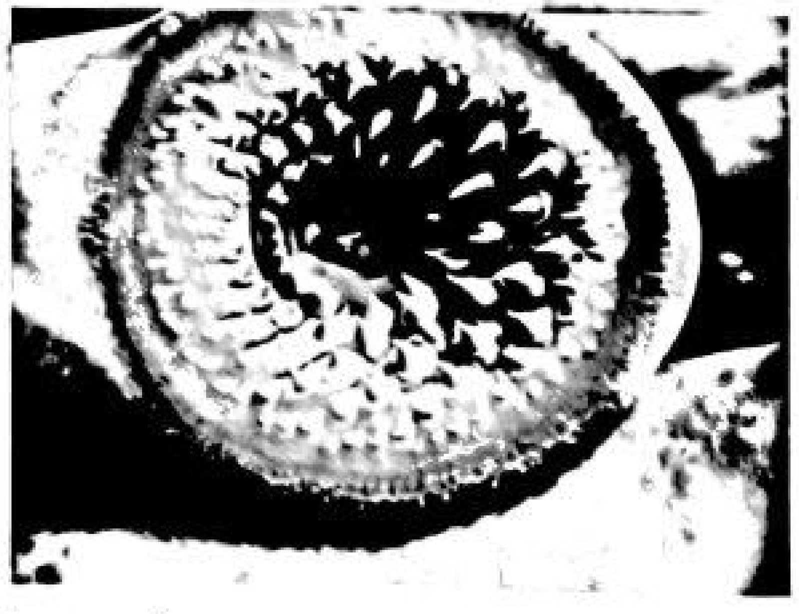
61 The organism shown in the given figure is representative of the subphylum Cephalochordata. This organism is:



1. *Ascidia*	2. *Amphioxus*
3. *Petromyzon*	4. *Exocoetus*

62 The figure shows the mouth of a chordate. It can easily be seen that:

I. The mouth is circular	II. Jaw is absent.



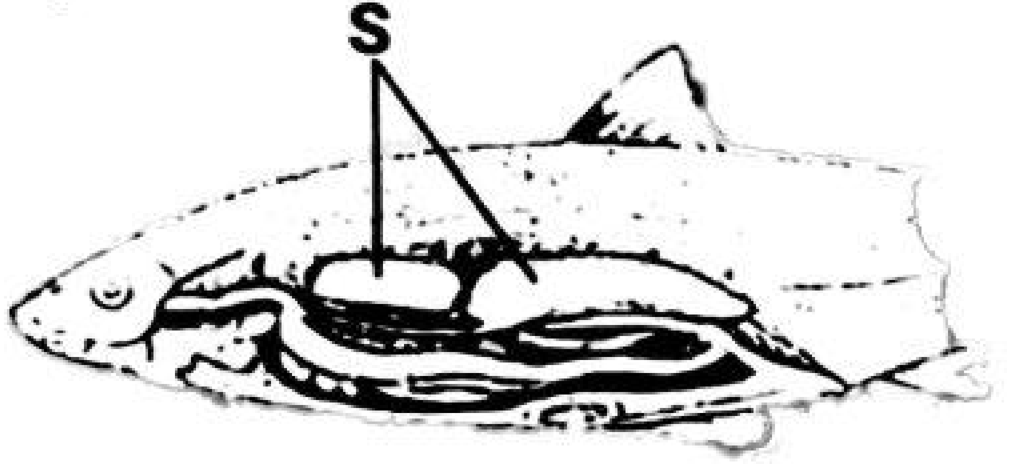
This chordate can be:

1. *Ascidia*	2. *Amphioxus*
3. *Petromyzon*	4. *Exocoetus*

63 Identify the incorrect statement regarding cyclostomes:

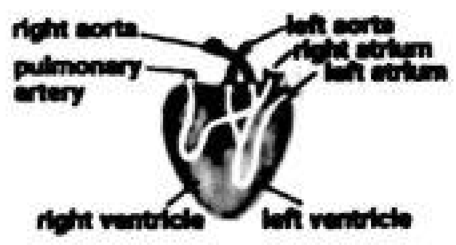
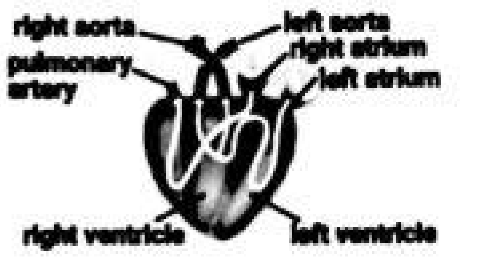
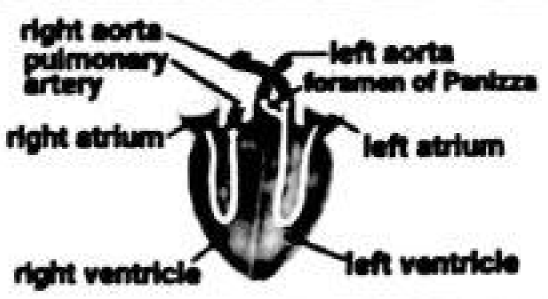
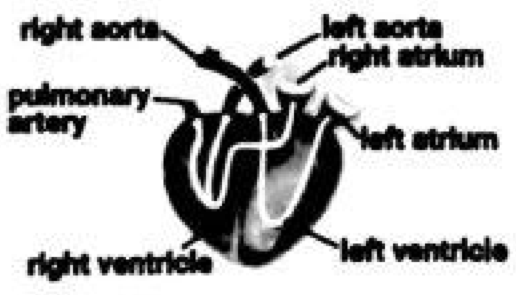
1.	Lampreys have direct development, but Hagfishes go through a larval stage followed by metamorphosis into a juvenile form.
2.	Unlike jawed vertebrates, which have three semicircular canals in each inner ear, lampreys have only two and hagfishes just one.
3.	The hagfish blood is isotonic with seawater, while lampreys appear to use the same gill-based mechanisms of osmoregulation as marine teleosts.
4.	Both hagfishes and lampreys have a single gonad.

64 The structure marked as 'S' in the given diagram helps bony fishes in:

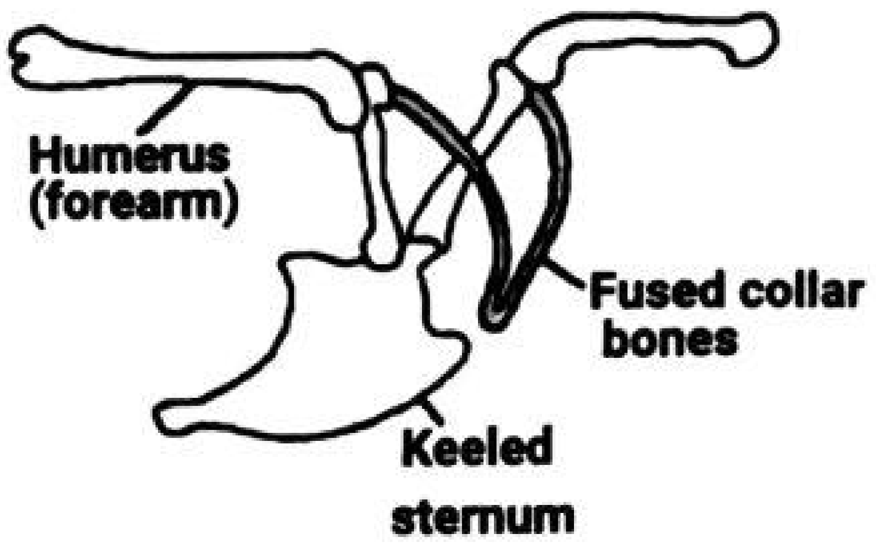


1. Oxygenation of blood
2. Achieving neutral buoyancy
3. Increasing absorptive surface area for food
4. Protection of the nerve cord

65 Which of the following reptilian hearts can be that of a crocodile?

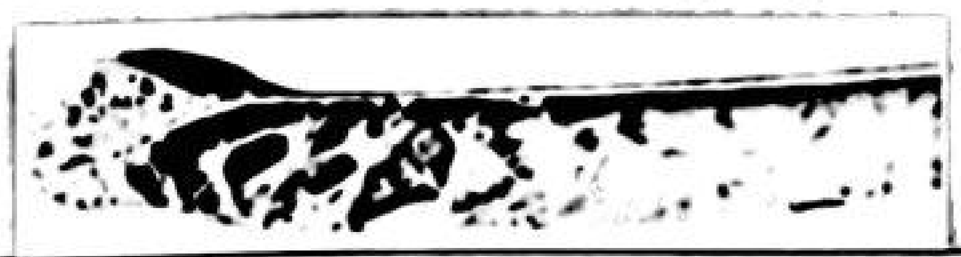
1.	 right aorta left aorta right atrium left atrium pulmonary artery right ventricle left ventricle	2.	 right aorta left aorta right atrium pulmonary artery left atrium right ventricle left ventricle
3.	 right aorta pulmonary artery left aorta foramen of Panizza right atrium left atrium right ventricle left ventricle	4.	 right aorta left aorta right atrium pulmonary artery left atrium right ventricle left ventricle

66 The following schematic diagram of a part of skeleton can be that of a/an:


Humerus (forearm)
Fused collar bones
Keeled sternum

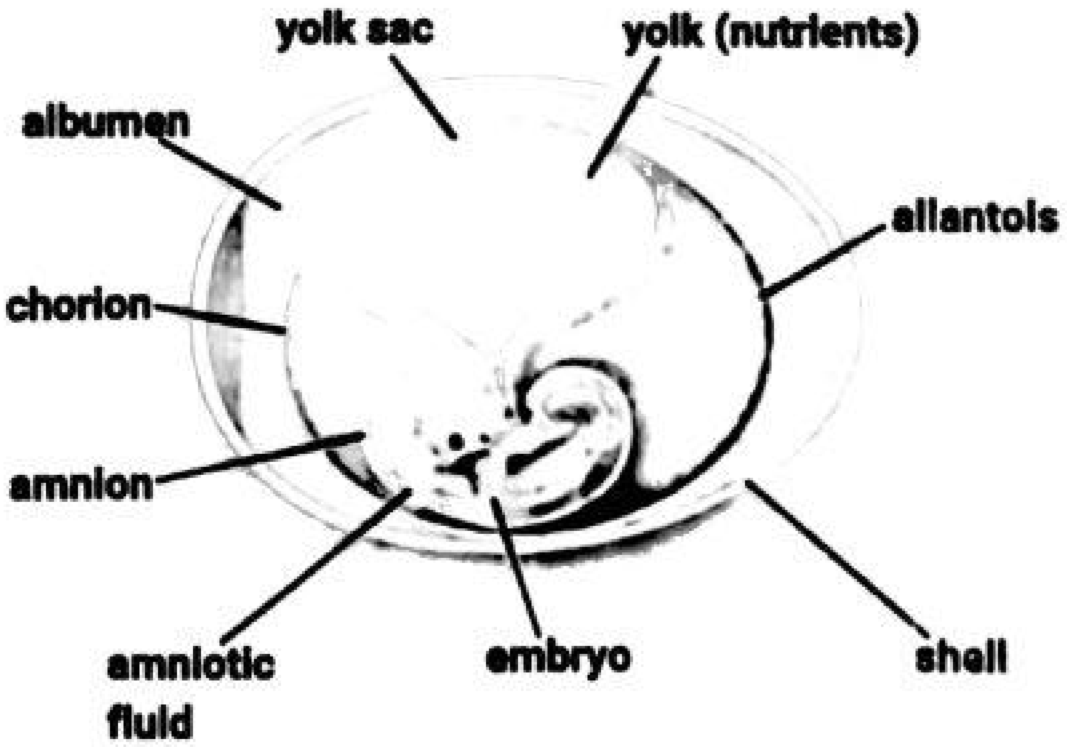
1.	Amphibian	2.	Reptile
3.	Bird	4.	Mammal

67 The bone structure in the following diagram shows:



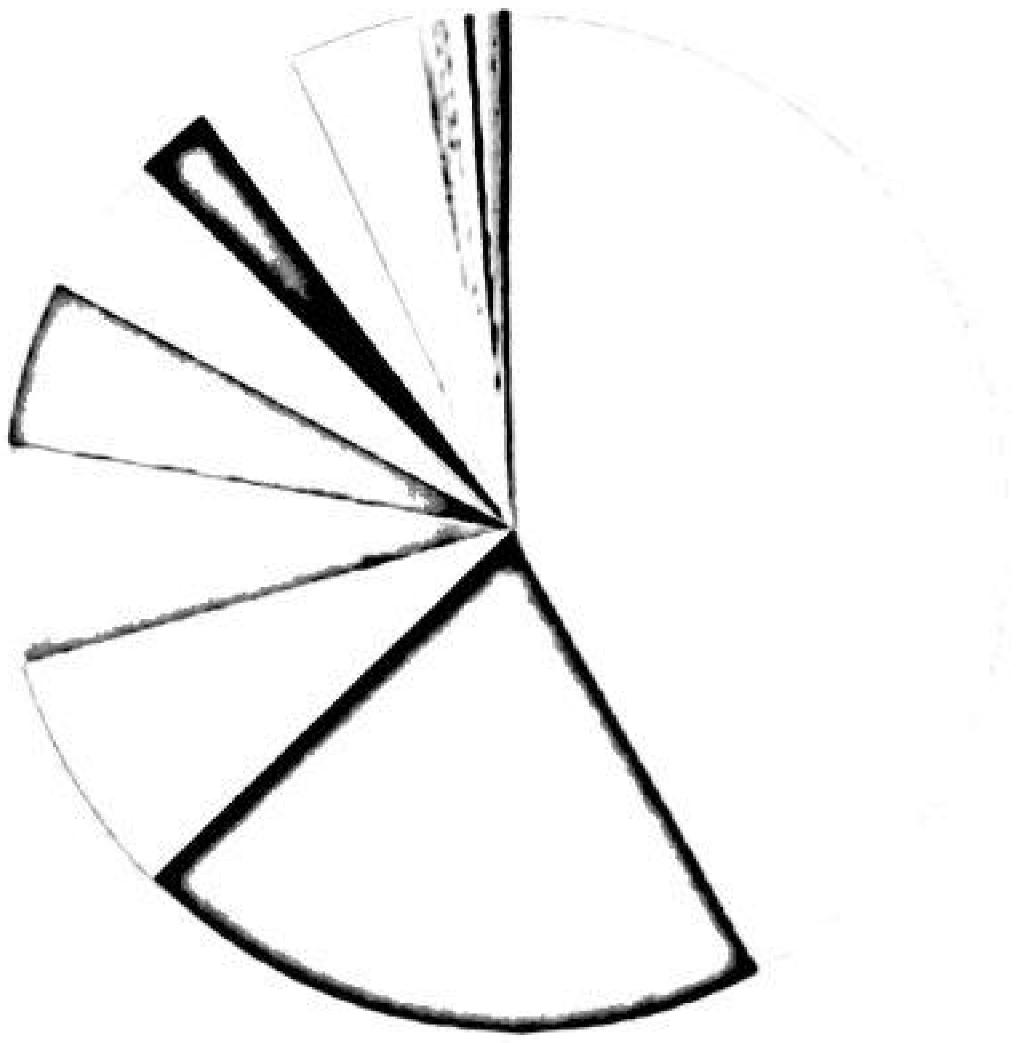
1.	Adaptation for flight in birds
2.	Presence of excess of the hemopoietic tissue in mammals
3.	Rudimentary limb bones in some reptiles
4.	Bone of forelegs of frogs

68 This type of egg cannot belong to a/an:


yolk sac
yolk (nutrients)
albumen
allantois
chorion
amnion
amniotic fluid
embryo
shell

1.	Amphibian	2.	Reptile
3.	Bird	4.	Mammal

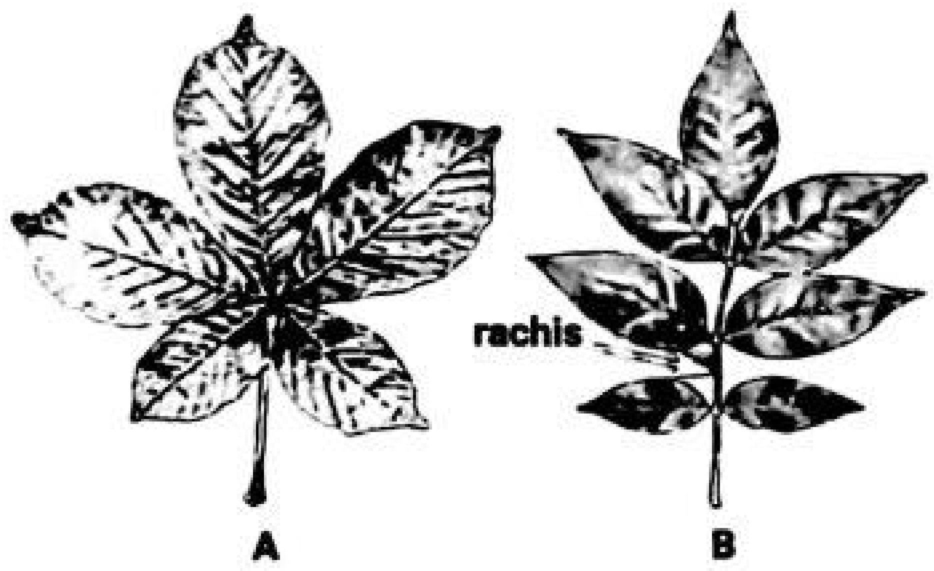
69 As you can see from the given pie chart, over 70% of Mammalia species come from a single order. Which order of class mammalian is this?



1.	Rodentia	2.	Chiroptera
3.	Carnivora	4.	Primata

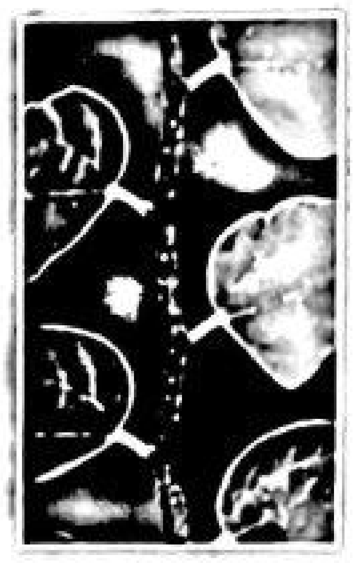
MORPHOLOGY OF FLOWERING PLANTS

70 What types of leaves are respectively shown in the given picture?



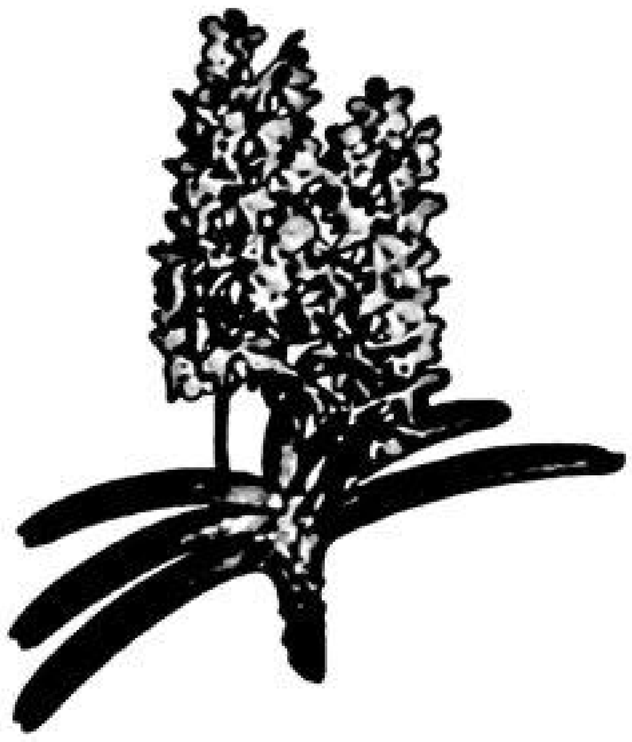
1.	Palmate and Pinnate	2.	Pinnate and Palmate
3.	Pentapinnate and Heptapinnate	4.	Heptapinnate and Pentapinnate

71 The phyllotaxy shown in the given picture is:



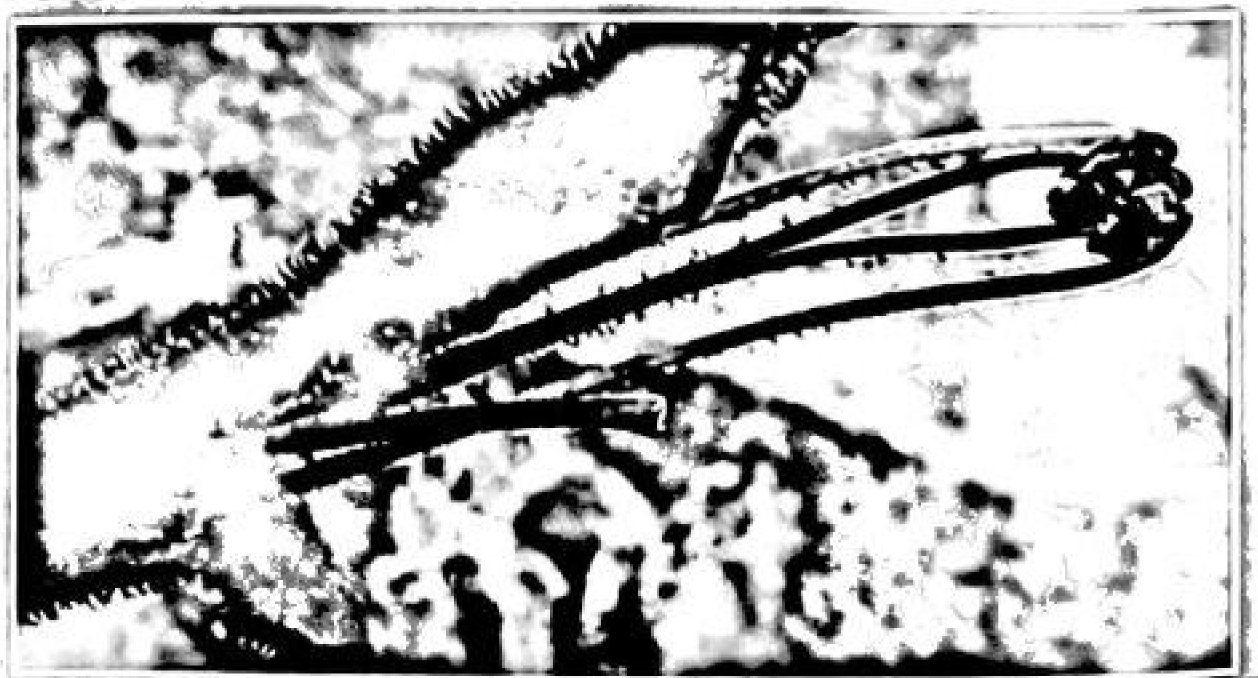
1.	Alternate	2.	Opposite
3.	Whorled	4.	Random

72 Identify the inflorescence:



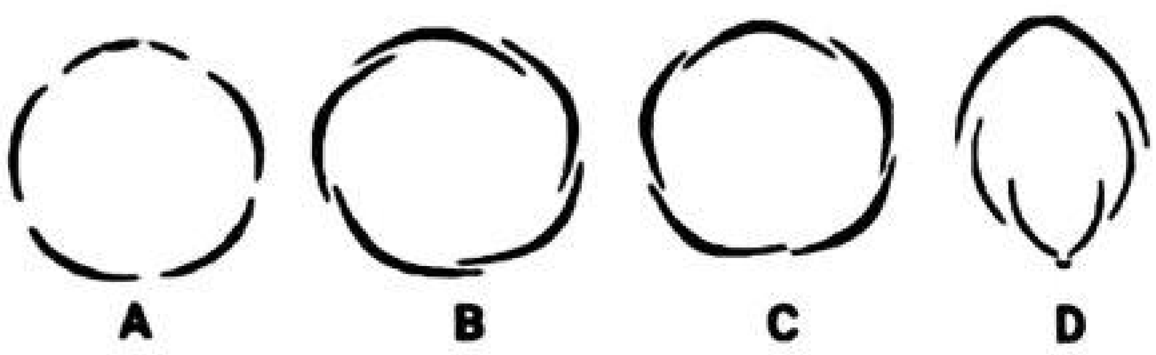
1.	Raceme	2.	Spike
3.	Spikelet	4.	Catkin

73 The condition of stamens shown in the given picture is called:



1. Diadelphous	2. Polyadelphous
3. Syngenesious	4. Synandrous

74 Imbricate aestivation is shown in the diagram part labeled:



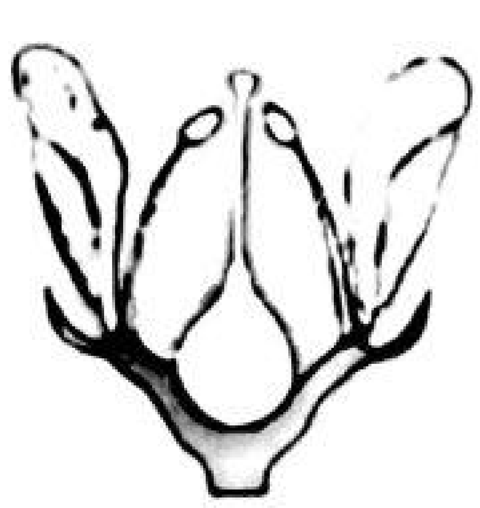
1.	A	2.	B
3.	C	4.	D

75 How many of the plants given in the box have actinomorphic flowers?

Mustard, Gulmohur, *Canna*, *Cassia*, *Datura*, Belladonna, *Petunia*, *Indigofera*, Tulip, *Asparagus*, Bean

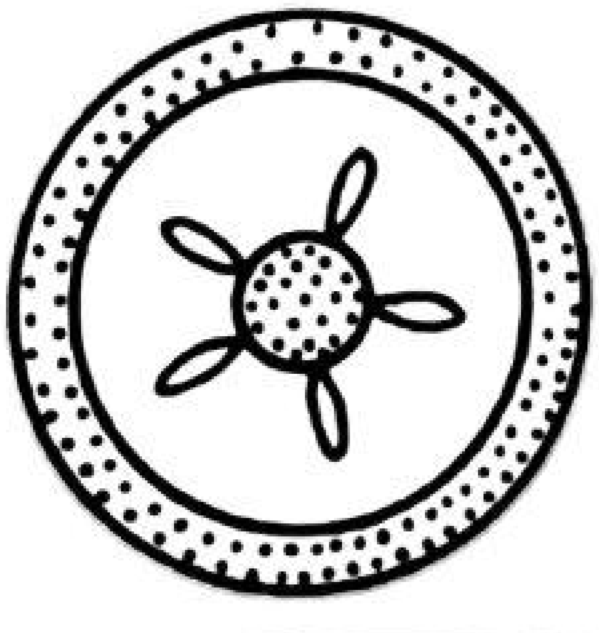
1.	5	2.	6
3.	7	4.	8

76 The position of the ovary shown in the given diagram would be:



1.	Superior	2.	Inferior
3.	Half inferior	4.	Double superior

77 The placentation shown below will be seen in:



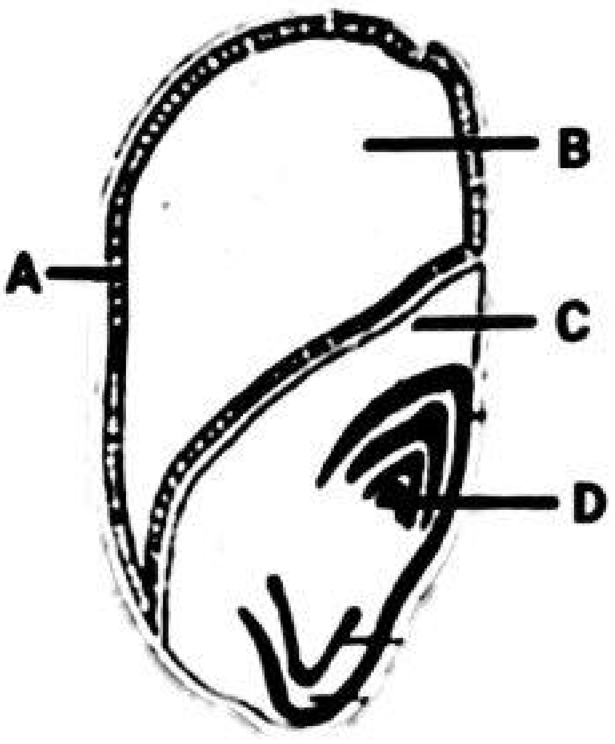
1.	*Argemone*	2.	*Dianthus*
3.	Tomato	4.	Sunflower

78 Consider the given four statements:

I:	Aggregate fruits develop from polycarpellary, apocarpous ovaries
II:	Composite fruit develops from inflorescence
III:	Parthenogenetic fruits develop from unfertilized ovaries
IV:	In false fruits, some of the flesh is not derived from the ovary, but from some adjacent tissue exterior to the carpel

1. Only I, II and III are correct
2. Only I, III and IV are correct
3. Only I, II and IV are correct
4. Only II, III and IV are correct

79 In the given diagram of structure of a monocotyledonous seed,



1. A represents the fused testa and tegmen
2. B secretes enzymes for hydrolysis of stored nutrients
3. C is the single cotyledon seen in the seed
4. D is the covering of the embryonic root

80 The term 'peripheral endosperm' in monocotyledonous seeds normally refers to:

1.	Epicarp	2.	Pericarp
3.	Aleurone layer	4.	Starchy endosperm

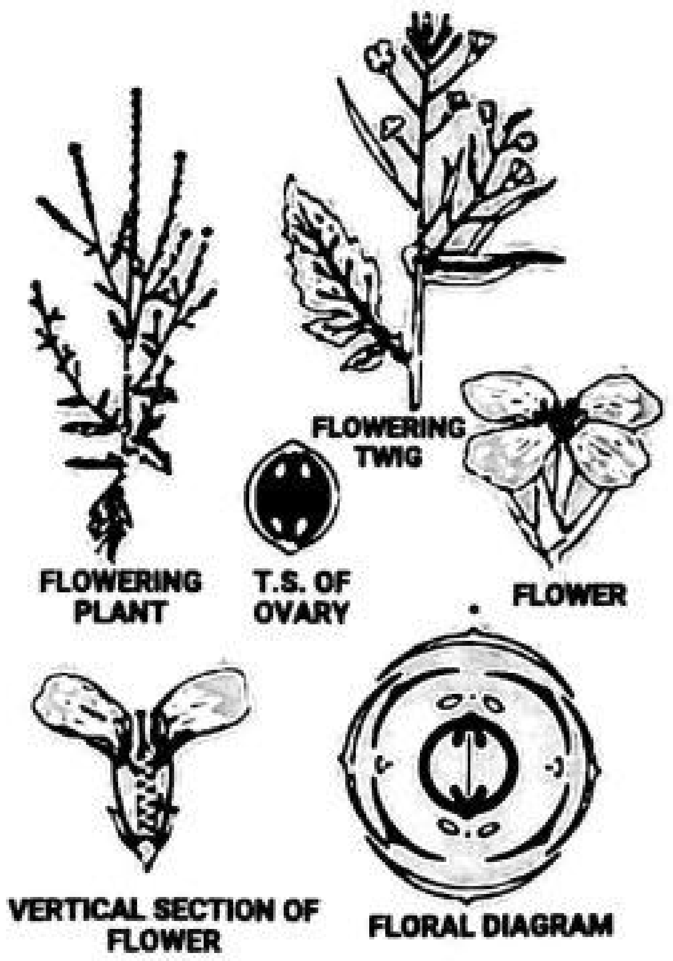
81 Match Column-I with Column-II

	Column I		Column II
(a)	$\% \, ⚥ \, K_{(5)} C_{1+2+(2)} A_{(9)+1} \underline{G}_1$	(i)	Brassicaceae
(b)	$\oplus \, ⚥ \, K_{(5)} \overbrace{C_{(5)} A_{(5)}} \underline{G}_2$	(ii)	Liliaceae
(c)	$\oplus \, ⚥ \, \overbrace{P_{(3+3)} A_{3+3}} \underline{G}_{(3)}$	(iii)	Fabaceae
(d)	$\oplus \, ⚥ \, K_{2+2} C_4 A_{2-4} \underline{G}_{(2)}$	(iv)	Solanaceae

Select the correct answer from the options given below.

	(a)	(b)	(c)	(d)
1.	(ii)	(iii)	(iv)	(i)
2.	(iv)	(ii)	(i)	(iii)
3.	(iii)	(iv)	(ii)	(i)
4.	(i)	(ii)	(iii)	(iv)

82 The floral features shown in the given figure characterizes the members of Family:



1. Fabaceae	2. Solanaceae
3. Liliaceae	4. Brassicaceae

ANATOMY OF FLOWERING PLANTS

83 Regarding the epidermal tissue system of angiosperms:

I:	Cuticle is absent in roots
II:	Guard cells are dumb-bell shaped in grasses and possess chloroplasts
III:	Root hairs are multicellular and the stem hairs are unicellular

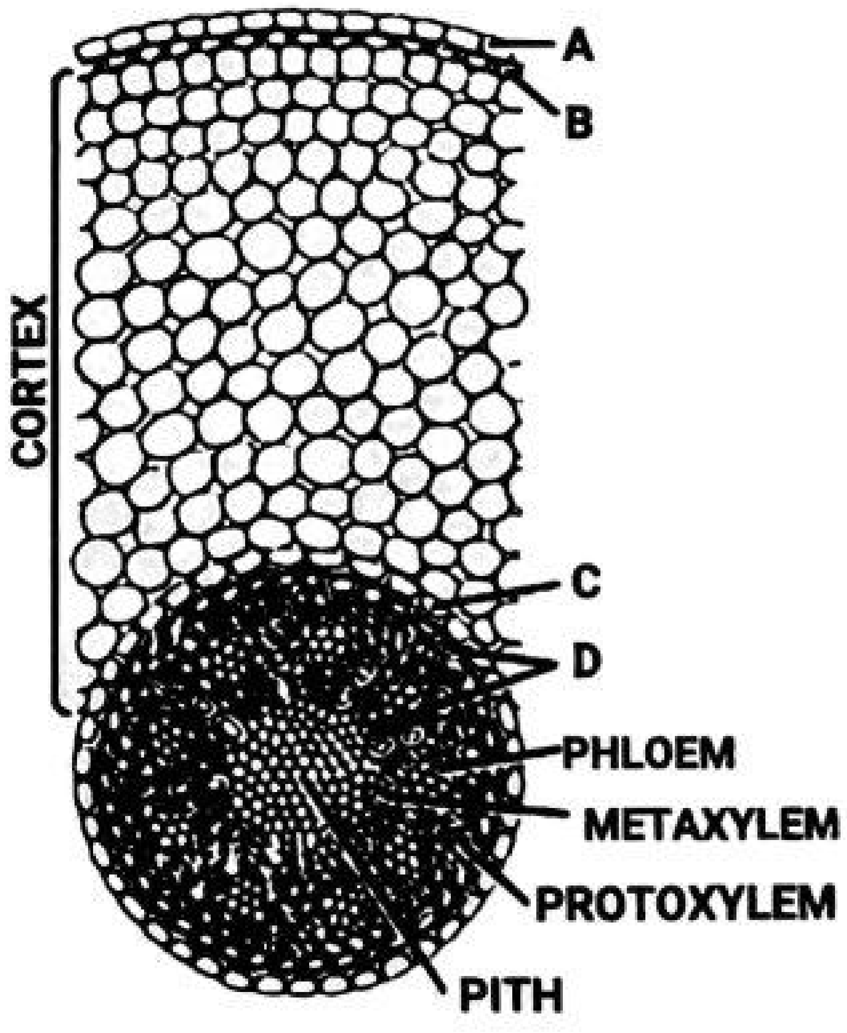
1. Only I is correct
2. Only I and II are correct
3. Only II is correct
4. Only II and III are correct

84 Consider the given two statements:

I:	Parenchyma cells in plants play an important role in regeneration and wound healing.
II:	They are living at maturity and usually have only primary walls.

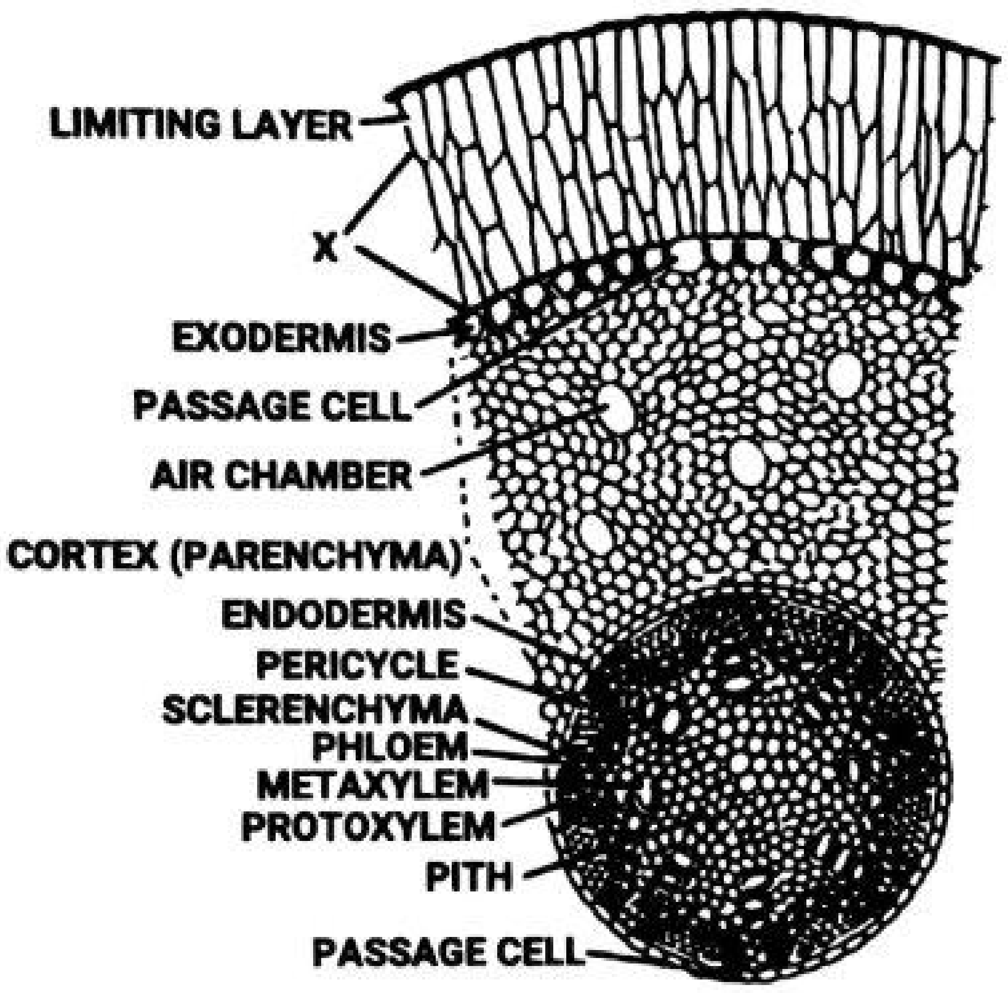
1. Both I and II are correct and II explains I
2. Both I and II are correct but II does not explain I
3. I is True but II is False
4. Both I and II are False

85 In the transverse section of a monocot root given below, identify A, B, C and D:



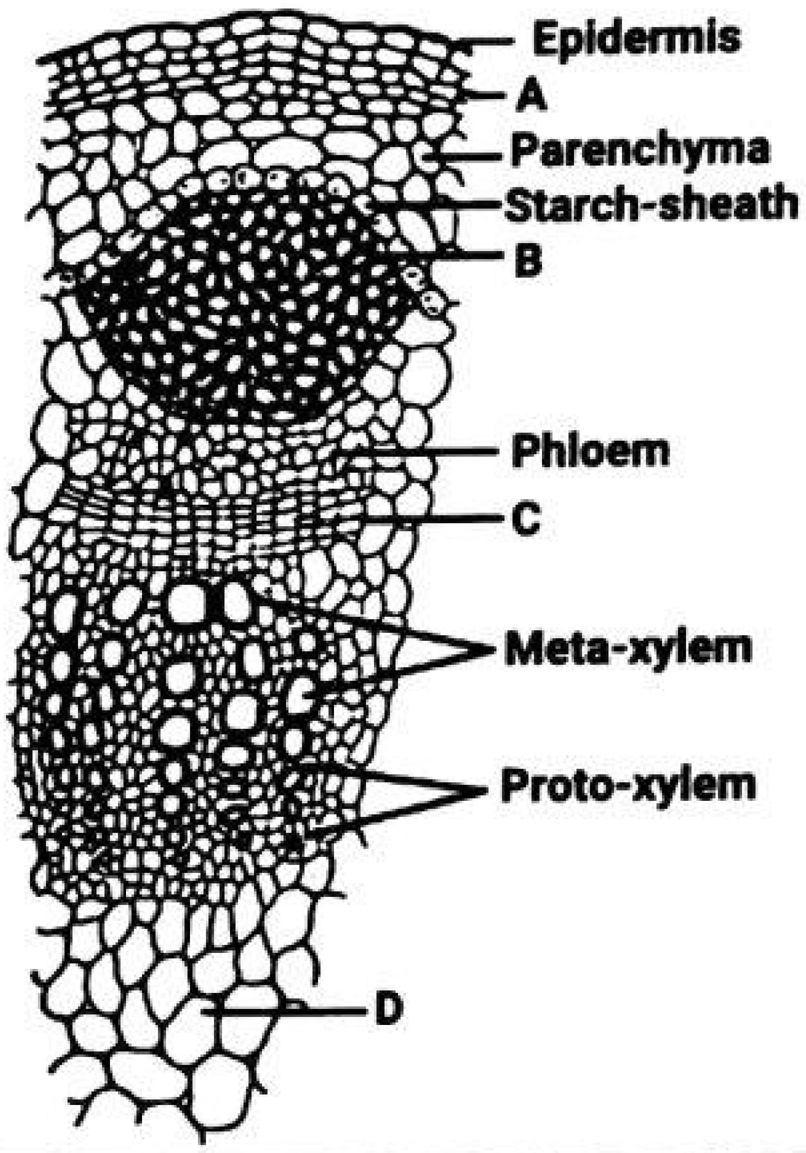
	A	B	C	D
1.	Epidermis	Exodermis	Endodermis	Pericycle
2.	Exodermis	Epidermis	Endodermis	Pericycle
3.	Epidermis	Exodermis	Pericyle	Endodermis
4.	Exodermis	Epidermis	Pericyle	Endodermis

86 The following diagram shows the anatomy of the root of an epiphytic orchid. The function of the structure marked X is:


LIMITING LAYER
X
EXODERMIS
PASSAGE CELL
AIR CHAMBER
CORTEX (PARENCHYMA)
ENDODERMIS
PERICYCLE
SCLERENCHYMA
PHLOEM
METAXYLEM
PROTOXYLEM
PITH
PASSAGE CELL

1. Photosynthesis
2. Storage
3. Protective
4. Repair and healing

87 In the transverse section of a young dicot stem, the term 'hard bast' will be used for the structure labeled:


Epidermis
A
Parenchyma
Starch-sheath
B
Phloem
C
Meta-xylem
Proto-xylem
D

1.	A	2.	B
3.	C	4.	D

88 While looking at a T.S. of a certain plant part you are convinced that it must be a monocot stem. Which of the following, if seen in the T.S. will give you confidence for your conclusion?

1.	Conjoint vascular bundles
2.	Presence of a hypodermis
3.	Presence of phloem parenchyma
4.	Presence of water containing cavities within the vascular bundles

89 Identify the option where the difference between the vascular bundles of Dicot and Monocot stem is not correctly mentioned:

	Dicot stem	Monocot stem
1.	Collateral and open	Collateral and closed
2.	Arranged in a ring	Scattered
3.	Larger toward the center	Of uniform size
4.	Phloem parenchyma present	Phloem parenchyma absent

90 Identify the option where the difference between the anantomy of Dicot and Monocot root is not correctly mentioned:

		Dicot root	Monocot root
1.	Xylem bundles	Numerous	Vary between 2 and 6
2.	Pith	Small/absent	Large/well developed
3.	Pericycle	Gives rise to lateral roots, cambium and cork cambium	Gives rise to lateral roots only
4.	Cambium	Appears later as a secondary meristem	Altogether absent

91 Match the plants in Column I with the description of anatomy of vascular bundles in them in Column II and select the correct option from the codes given:

Column I	Column II
A. Dicot stem	a. Collateral, closed and scattered in ground tissue
B. Monocot stem	b. Conjoint, collateral endarch and open
C. Dicot root	c. Radial, exarch and polyarch [usually more than 6]
D. Monocot root	d. Radial, exarch and 2 to 6 in number

Codes

	A	B	C	D
1.	a	b	c	d
2.	b	a	d	c
3.	a	b	d	c
4.	b	a	c	d

STRUCTURAL ORGANISATION IN ANIMALS

92 Consider the two statements:

Statement I:	Morphology refers to the form and structure of animals and plants, studied as a science.
Statement II:	Anatomy is concerned with the identification and description of the body structures of living things.

1. **Statement I** and **Statement II** are incorrect
2. **Statement I** is correct and **Statement II** is incorrect
3. **Statement I** and **Statement II** are correct
4. **Statement I** is incorrect and **Statement II** is correct

93 Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R):

Assertion (A):	The skin of a frog is always kept moist and has a mucus covering.
Reason (R):	Frogs respire through the skin as well.

In the light of the above statements choose the correct answer from the options given below:

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	Both **(A)** and **(R)** are False.

94 Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R):

Assertion (A):	The alimentary canal in frogs is short.
Reason (R):	Frogs are carnivores.

In the light of the above statements choose the correct answer from the options given below:

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	Both **(A)** and **(R)** are False.

95 Identify whether the given statements are true [T] or false [F] regarding frog:

I:	Bile emulsifies fat.
II:	Pancreatic juices digest carbohydrates and proteins.
III:	Digested food is absorbed by the numerous finger-like folds in the inner wall of intestine called villi and microvilli.
IV:	The undigested solid waste moves into the rectum and passes out through cloaca.

	I	II	III	IV
1.	T	T	F	T
2.	F	T	T	F
3.	T	T	T	T
4.	T	F	F	T

96 How many of the given statements regarding the anatomy of frogs are correct?

A:	Kidneys are situated a little posteriorly in the body cavity on both sides of the vertebral column.
B:	Each kidney is composed of several structural and functional units called uriniferous tubules or nephrons.
C:	Two ureters emerge from the kidneys in male frogs, where the ureters act as urinogenital ducts that open into the cloaca.
D:	In females, the ureters and oviduct open separately in the cloaca.

1.	1	2.	2
3.	3	4.	4

97 Trace the correct path of passage of the sperm in male *Rana tigrina*:

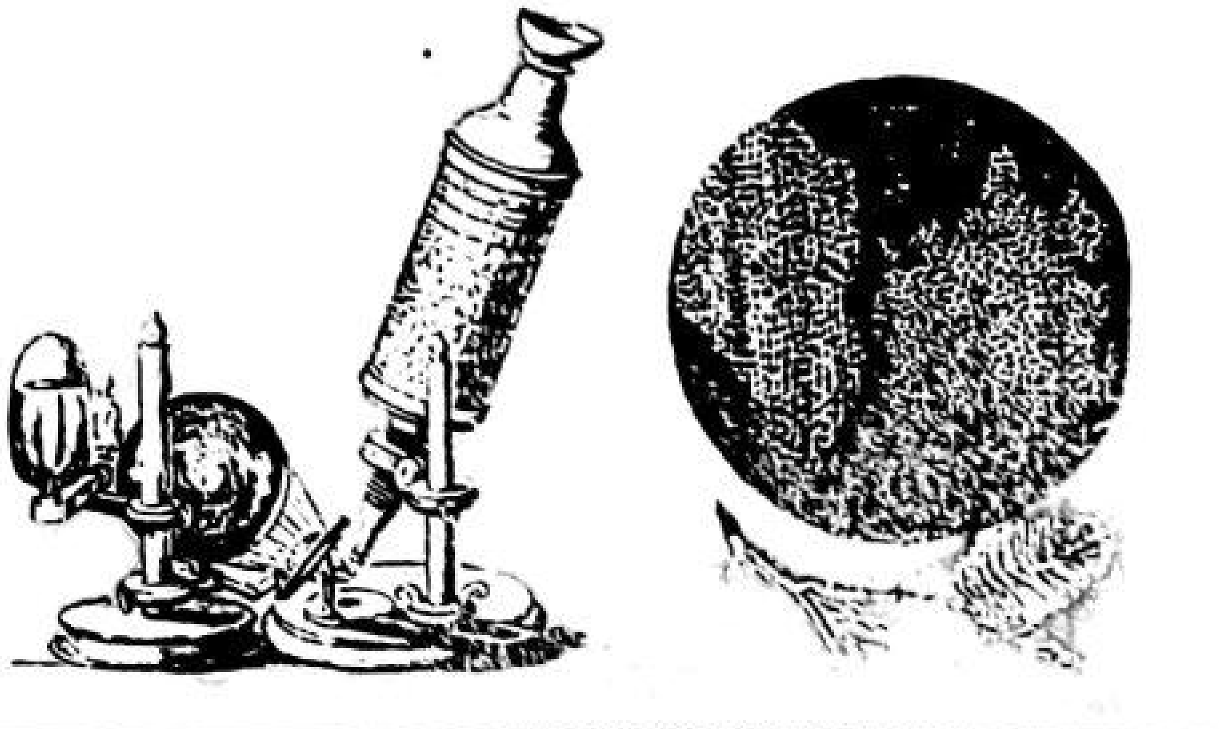
1.	Testes → Vasa efferentia → Kidney → Seminal vesicle → Urogenital duct → Cloaca
2.	Testes → Vasa efferentia → Bidder's canal → Ureter → Cloaca
3.	Testes → Vasa efferentia → Kidney → Bidder's canal → Urogenital duct → Cloaca
4.	Testes → Bidder's canal → Kidney → Vasa efferentia → Urogenital duct → Cloaca

98 In frog:

1.	Fertilisation is external, takes place in water while development involves a larval stage called tadpole that undergoes metamorphosis to form the adult.
2.	Fertilisation is internal, takes place inside the female body while development involves a larval stage called tadpole that undergoes metamorphosis to form the adult.
3.	Fertilisation is external, takes place in water while development involves a larval stage called instar that undergoes paurometabolous metamorphosis to form the adult.
4.	Fertilisation is internal, takes place inside the female body while development involves a larval stage called instar that moults 13 times to form the adult.

CELL - THE UNIT OF LIFE

99 In 1665, Robert Hooke watched cork under his microscope and sketched his findings as given in the figure. This was the discovery of cell, a very important landmark in the development of cell theory contributed by various scientists. Identify the correctly matched contributions of scientists in the formulation of the cell theory:



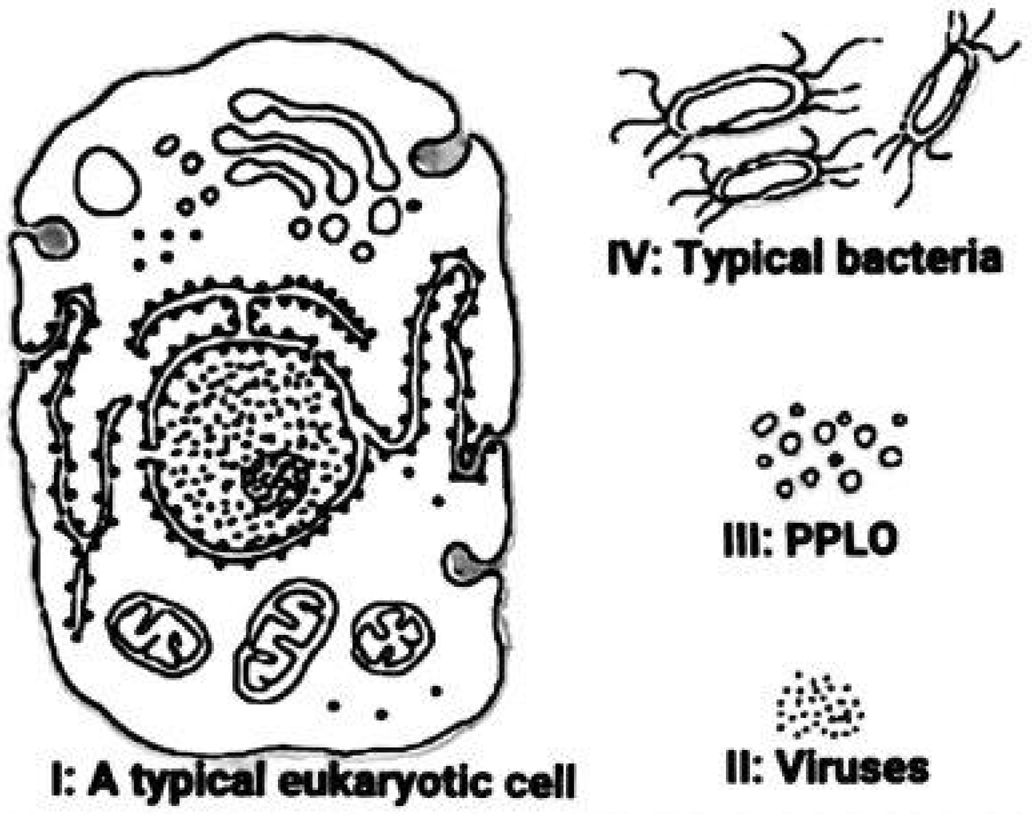
A.	Anton Von Leeuwenhoek	The first man to witness a live cell under a microscope.
B.	Schleiden and Schwann	Proposed cell theory
C.	Rudolph Virchow	Proposed spontaneous generation of life

1.	Only **A** and **B**	2.	Only **A** and **C**
3.	Only **B** and **C**	4.	**A, B** and **C**

100 Who first saw and described a living cell?

1.	Anton Von Leeuwenhoek	2.	Robert Hooke
3.	Robert Brown	4.	Rudolph Virchow

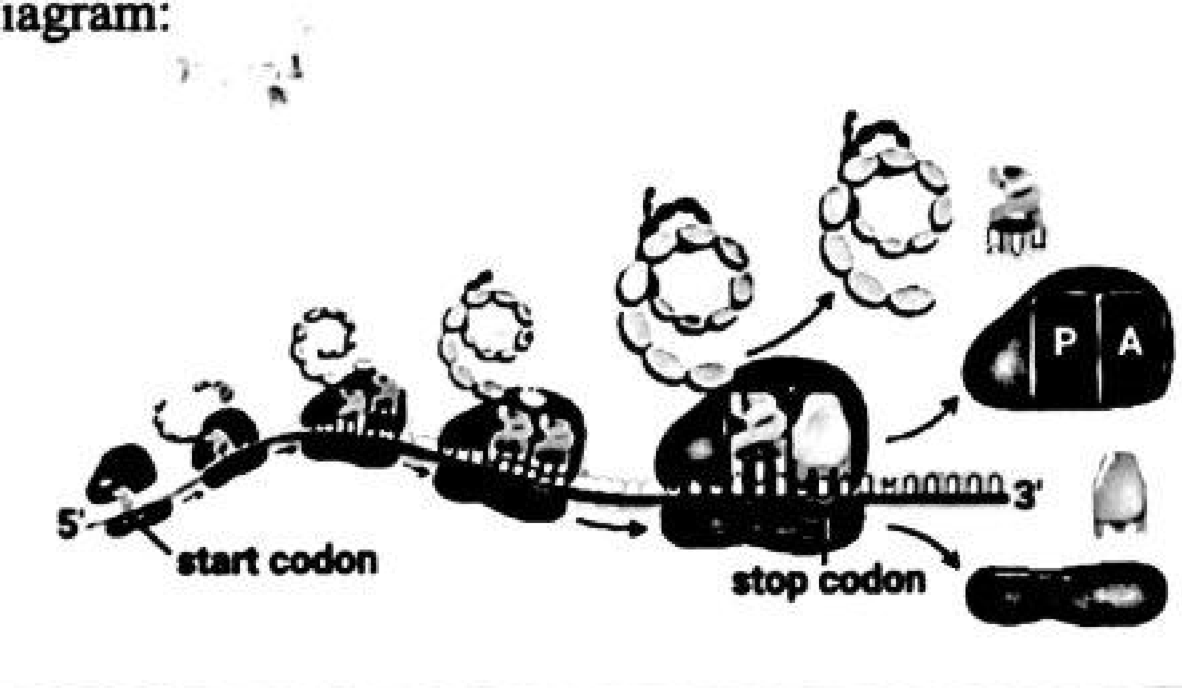
101 The diagram shows comparison of size of eukaryotic cell with other organisms. What would be the correct size for I, II, III and IV?


IV: Typical bacteria
III: PPLO
I: A typical eukaryotic cell
II: Viruses

I:	10-20 μm
II:	0.2-2.0 μm
III:	About 10 μm
IV:	1-2 μm

1.	Only **I** and **III**	2.	Only **I** and **IV**
3.	Only **II** and **III**	4.	Only **I, II** and **IV**

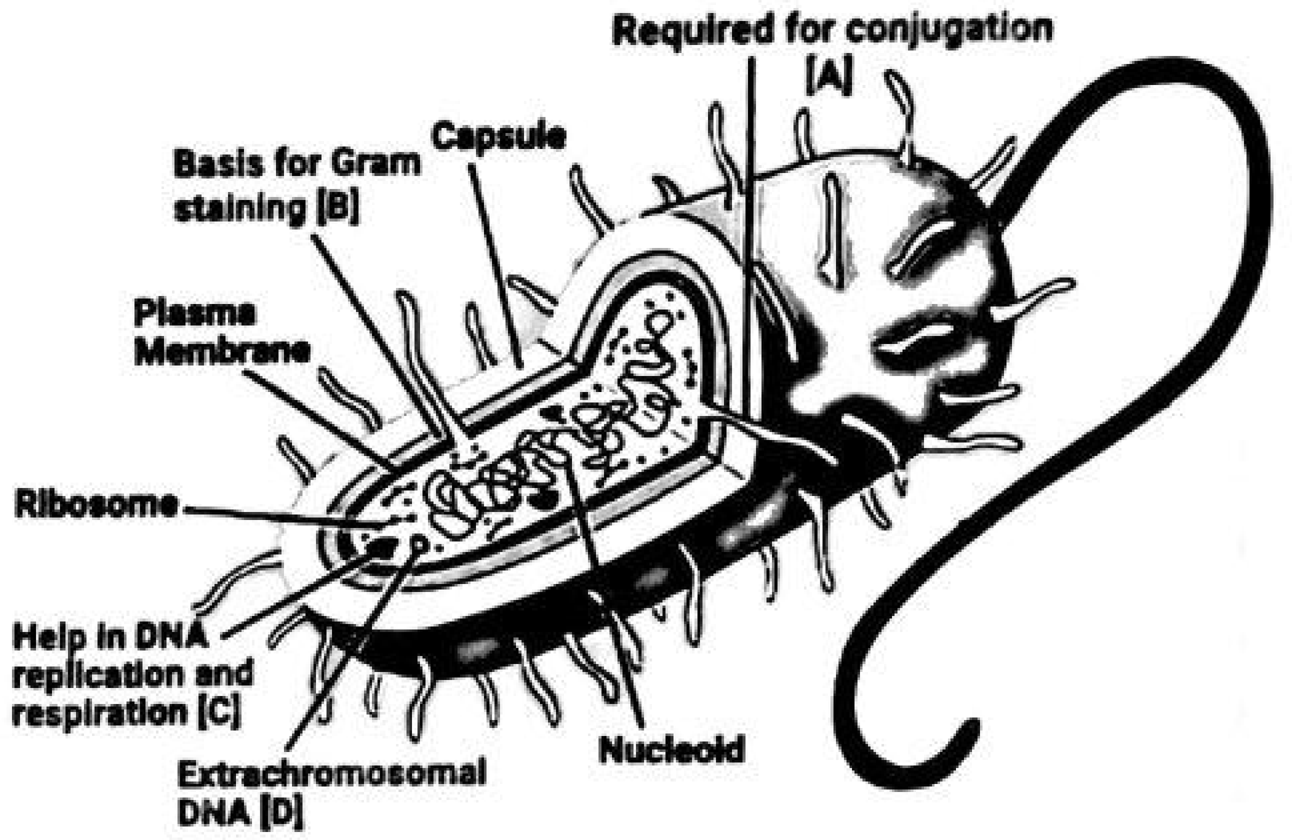
102 Identify the correct statement regarding the given diagram:


P
A
5'
3'
start codon
stop codon

I:	It shows a polysome.
II:	All ribosomes will be translating the same protein.

1.	Only **I**	2.	Only **II**
3.	Both **I** and **II**	4.	Neither **I** nor **II**

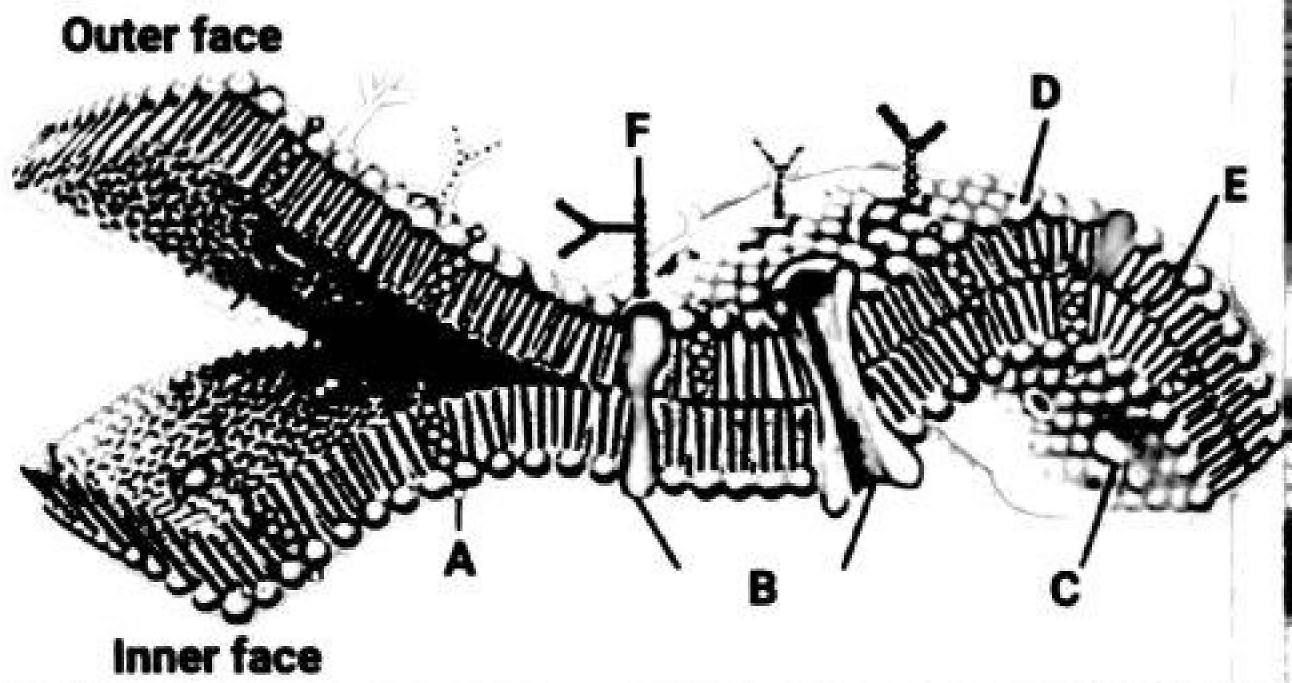
103 In the given diagram of a prokaryotic cell, identif the correct names for the structure labelled in red:


Required for conjugation [A]
Capsule
Basis for Gram staining [B]
Plasma Membrane
Ribosome
Help in DNA replication and respiration [C]
Extrachromosomal DNA [D]
Nucleoid

A:	Fimbriae	**B:**	Cell wall
C:	Mesosome	**D:**	Plastid

1.	Only **A** and **B**	2.	Only **B** and **D**
3.	Only **B** and **C**	4.	Only **A** and **D**

104 Study the statements given regarding the diagram showing the structure of a typical cell membrane.


Outer face
F
D
E
A
B
C
Inner face

I:	A is a major component of animal plasma membranes and it regulates the fluidity of the overall membrane.
II:	B are integral proteins and C is an extrinsic protein.
III:	D is the hydrophobic head of the phospholipid and E is its hydrophilic tail.
IV:	F is a carbohydrate found only on the outer surface of the membrane.

1.	Only I, II and III	2.	Only I, II and IV
3.	Only II III and IV	4.	I, II, III and IV

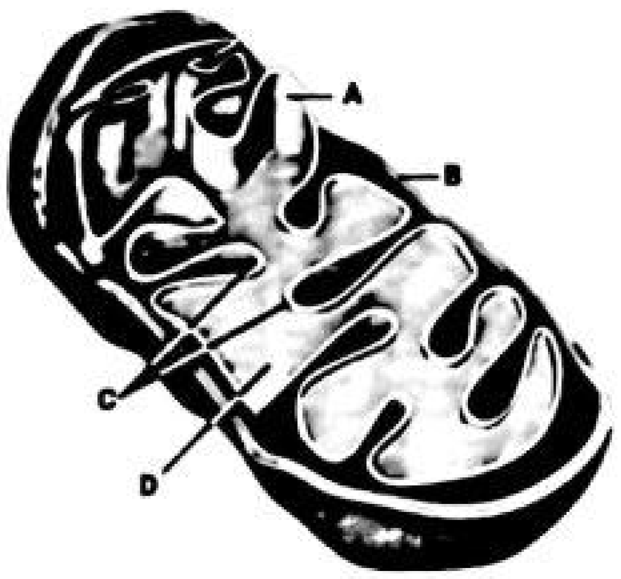
105 Keeping in view the fluid mosaic model for the structure of cell membrane, which one of the following statement is correct with respect to movements of lipids and proteins from one lipid monolayer to the other (described as flip flop movement) ?
1. While proteins can flip-flop, lipids cannot
2. Neither lipids nor proteins can flip-flop
3. Both lipids and proteins can flip-flop
4. While lipids can rarely flip-flop, proteins cannot

106 Consider the given two statements:

I:	Chloroplasts are considered endosymbiotic Cyanobacteria.
II:	Cyanobacteria consist of free-living photosynthetic bacteria.

1. Both I and II are correct and II explains I
2. Both I and II are correct but II does not explain I
3. I is correct and II is incorrect
4. Both I and II are incorrect

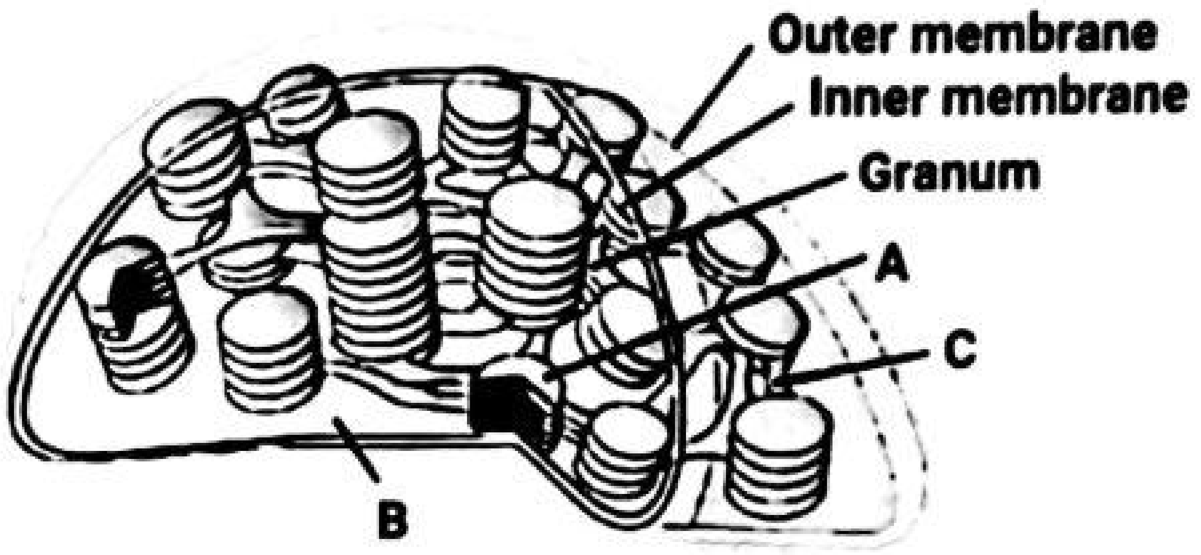
107 Identify the correct match for the structures shown in the diagram of a mitochondrion:



A	Inner membrane	Site of location of electron transport chain
B	Outer membrane	Forms the continuous limiting boundary of the organelle
C	Cristae	Increase the surface area
D	Matrix	Site for Kreb's cycle

1. Only A, B, and C
2. Only A, B, and D
3. Only B, C, and D
4. A, B, C, and D

108 What would be true for the structures shown in the given diagram of chloroplast?



I:	A is the site of the location of the enzymes for the biosynthetic phase of photosynthesis in higher plants.
II:	B is the site for the location of the photosynthetic pigments organized into photosystems.
III:	C lacks PS II as well as NADP reductase enzyme.

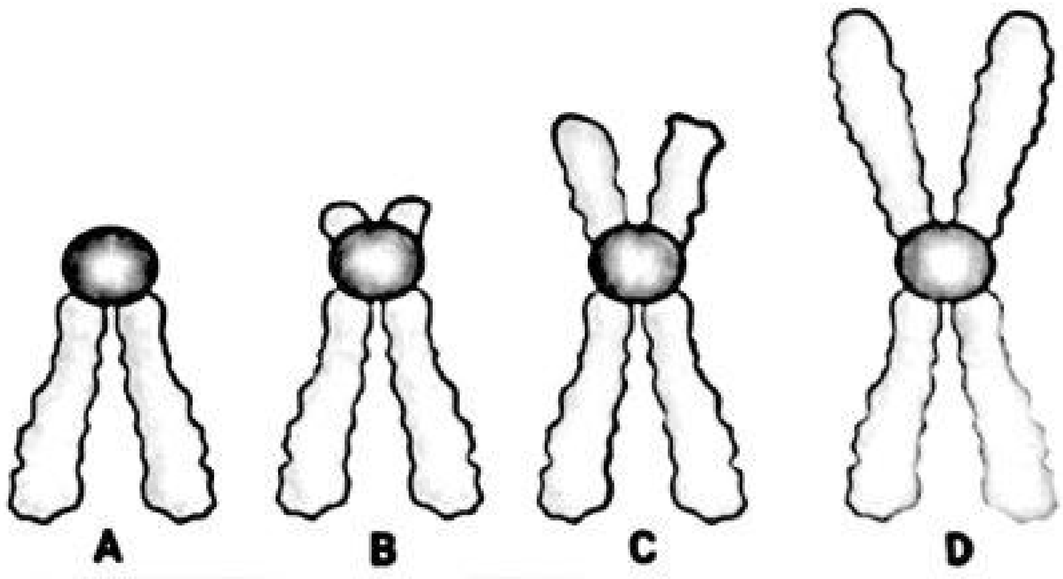
1.	Only I and II	2.	Only III
3.	Only II	4.	I, II and III

109 Consider the following two statements:

I:	Secondary constrictions can be used as markers to identify the particular SAT chromosomes.
II:	The secondary constrictions are always constant in their positions.

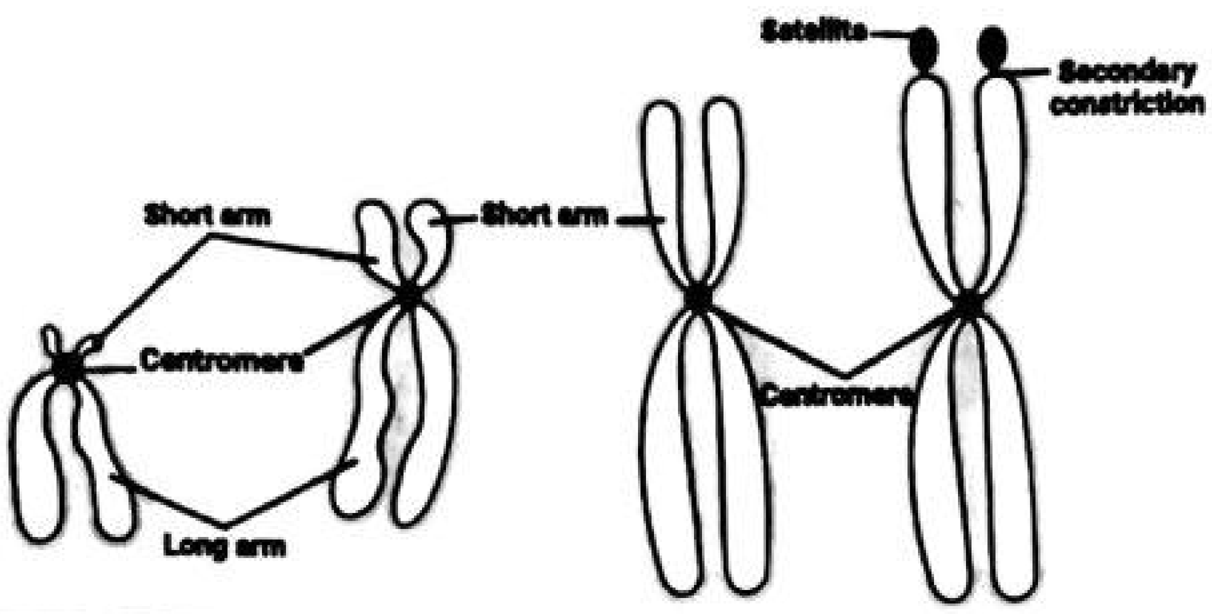
1. Both I and II are correct and II explains I
2. Both I and II are correct but II does not explain I
3. I is correct and II is incorrect
4. Both I and II are incorrect

110 Identify the type of chromosomes not seen in human karyotype:



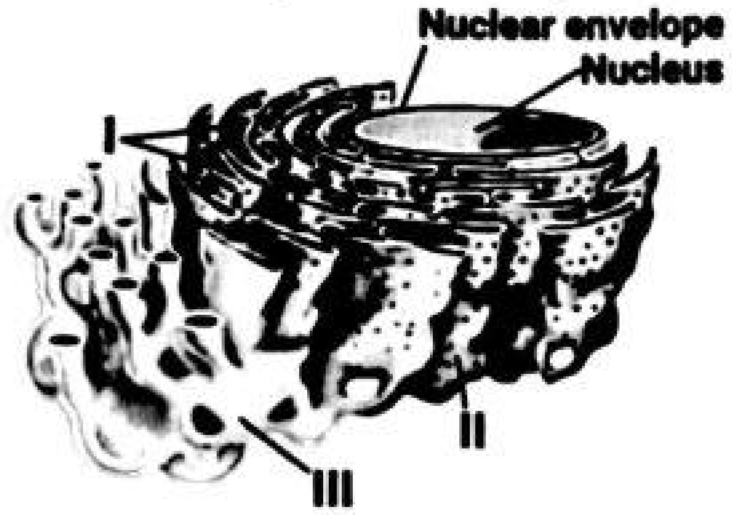
1.	Type A	2.	Type B
3.	Type C	4.	Type D

111 The type of chromosome not shown in the figure given below will be:


Satellite
Secondary constriction
Short arm
Short arm
Centromere
Centromere
Long arm

1. metacentric	2. sub-metacentric
3. acrocentric	4. telocentric

112 Study the given diagram and select the correct statements regarding the parts labels I, II and III.


Nuclear envelope
Nucleus
I
II
III

A:	I are ribosomes and found only in eukaryotic cells.
B:	II is Rough Endoplasmic Reticulum frequently observed in cells actively involved in protein synthesis and secretion.
C:	III is Smooth Endoplasmic Reticulum which is a major site for synthesis of lipids.

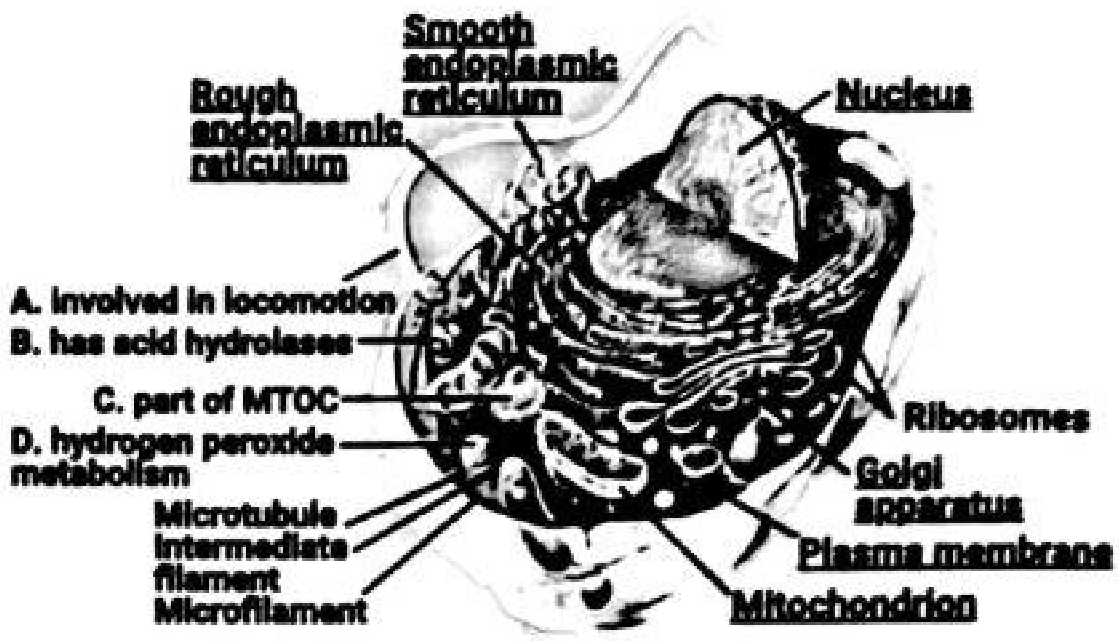
1.	Only A and B	2.	Only A and C
3.	Only B and C	4.	A, B and C

113 Consider the given two statements:

I:	Several antibiotics (notably the penicillins and cephalosporins) stop bacterial infections by interfering with cell wall synthesis
II:	Such antibiotics have no effects on human cells which have no cell wall, only a cell membrane

1. Both I and II are correct and II explains I
2. Both I and II are correct but II does not explain I
3. I is correct and II is incorrect
4. Both I and II are incorrect

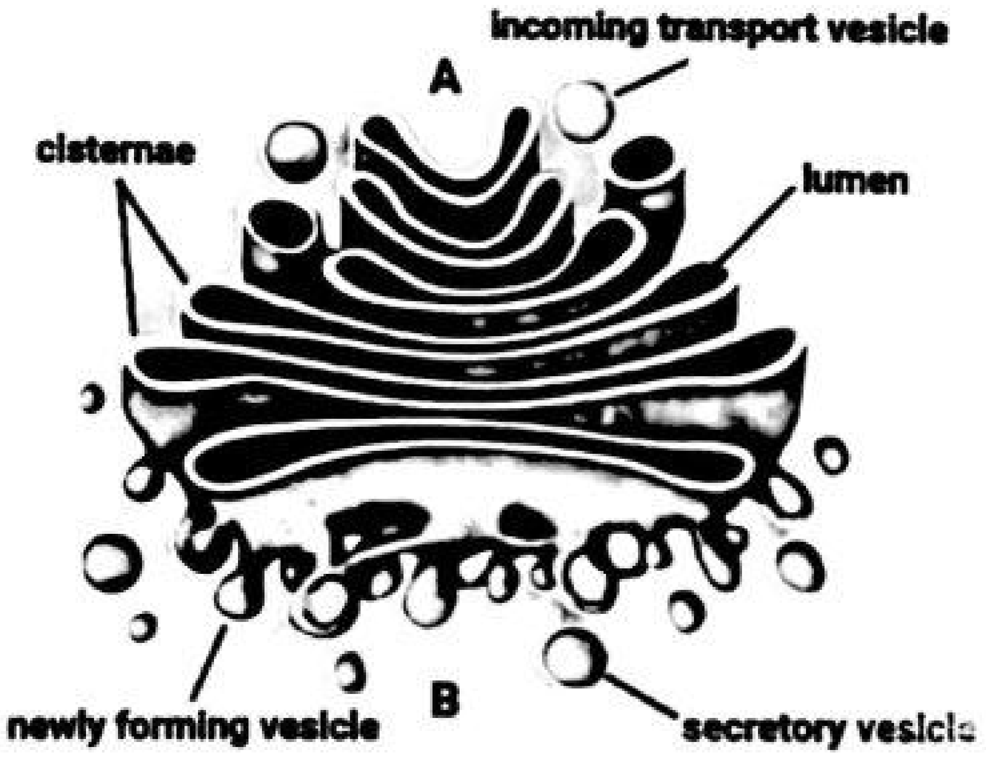
114 The diagram shows a typical animal cell. Th functions of some of its parts are labelled in the diagram What be true for these parts?


Smooth endoplasmic reticulum
Rough endoplasmic reticulum
Nucleus
A. Involved in locomotion
B. has acid hydrolases
C. part of MTOC
D. hydrogen peroxide metabolism
Ribosomes
Golgi apparatus
Microtubule
Intermediate filament
Microfilament
Plasma membrane
Mitochondrion

I:	A is the flagellum which is made of protein flagellin and is made of a filament, a hook, and basal body.
II:	B is lysosome which is a double membrane-bound organelle.
III:	C is the centrosome and it has two centrioles oriented perpendicular to each other.
IV:	D is peroxisome and has catalase present in it.

1.	Only I and II	2.	Only I and III
3.	Only II and III	4.	Only III and IV

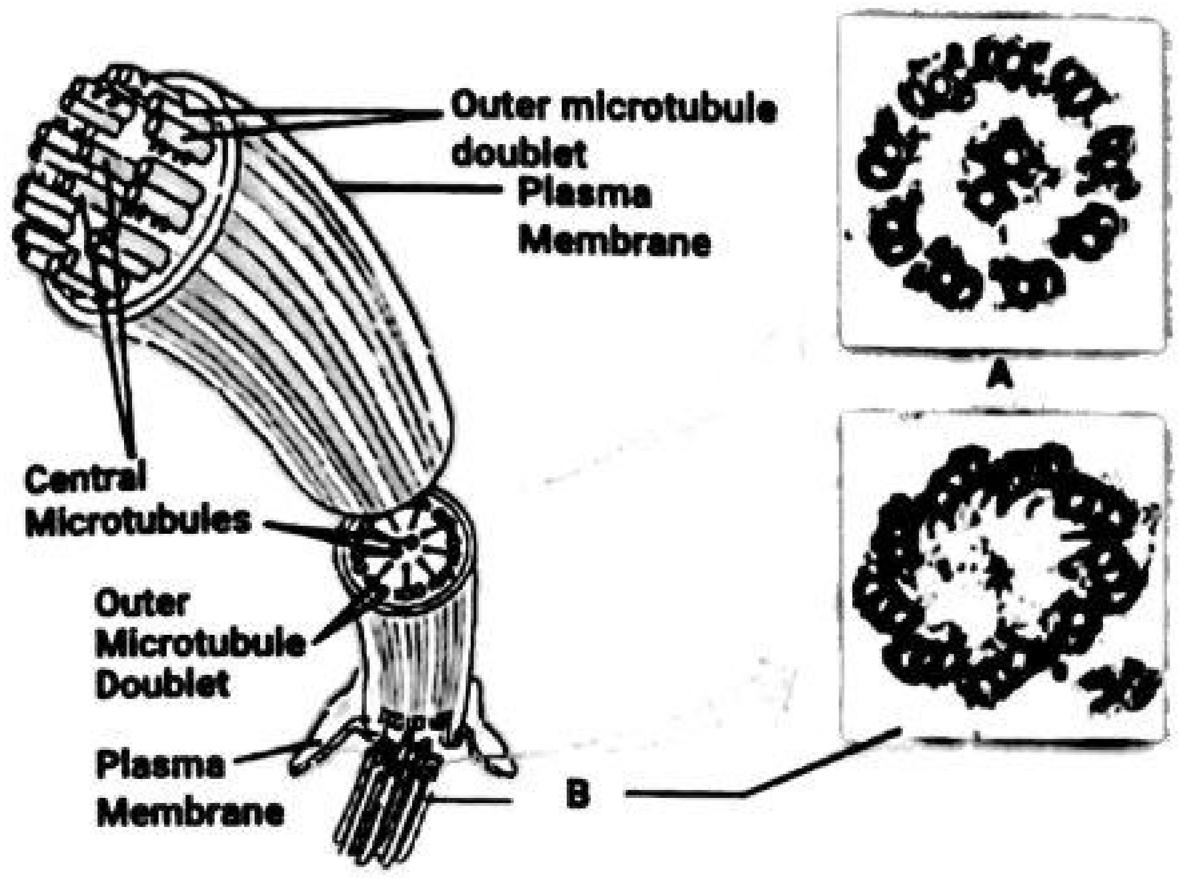
115 The diagram shows the structure of a Golg apparatus where A and B are its two surfaces.


incoming transport vesicle
A
cisternae
lumen
newly forming vesicle
B
secretory vesicle

I:	A is the cis face and B is the trans face.
II:	The two faces are entirely different but interconnected.

1. Only I is correct	2. Only II is correct
3. Both I and II are correct	4. Both I and II are incorrect

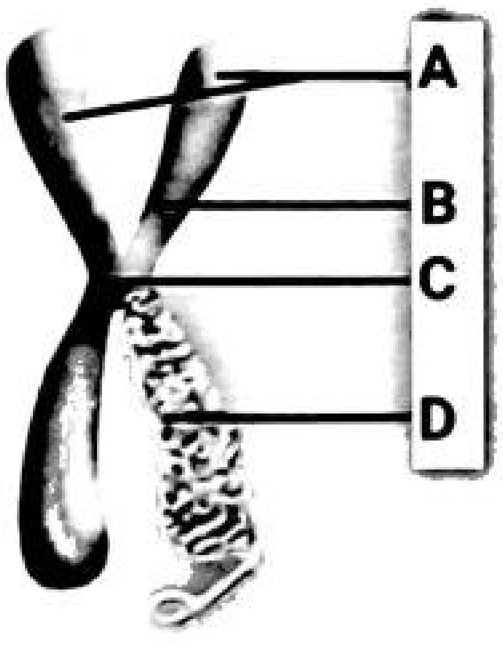
116 Identify the correct statements regarding the structures shown in the given diagram.


Outer microtubule doublet
Plasma Membrane
A
Central Microtubules
Outer Microtubule Doublet
Plasma Membrane
B

I:	A is the transverse section of the axoneme of a flagellum showing 9 + 2 arrangement of the microtubules.
II:	B is the basal body that has an ultrastructure identical to centriole.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

117 Identify the incorrectly matched pair:

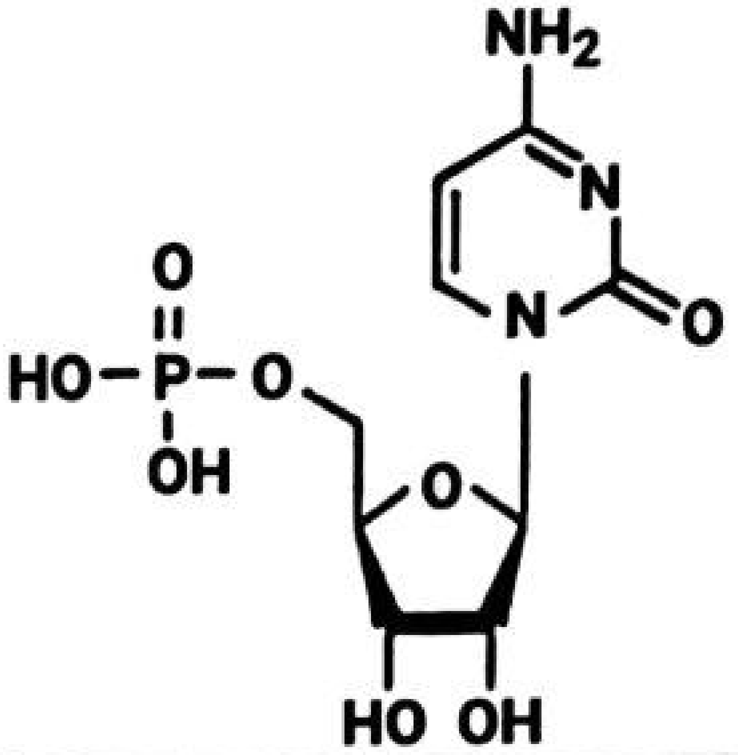


I:	A	Sister chromatids
II:	B	Q arm of the chromosome
III:	C	Centromere
IV:	D	P arm of the chromosome

1.	Only **I** and **II**	2.	Only **II** and **IV**
3.	Only **I** and **III**	4.	Only **I**

BIOMOLECULES

118 Identify the given biomolecule:


NH2
N
N
O
O
HO-P-O
OH
O
HO OH

1.	Thymine	2.	Thymosine
3.	Thymidylic acid	4.	Cytidylic acid

119 Match each item in Column I with only one item in Column II and select the correct match from the codes given:

Column I [Component]	**Column II [% of the total cellular mass]**
A. Protein	P. 2
B. Carbohydrates	Q. 1
C. Lipids	R. 5-7
D. Nucleic acids	S. 3
	T. 10-15
	U. 70-90

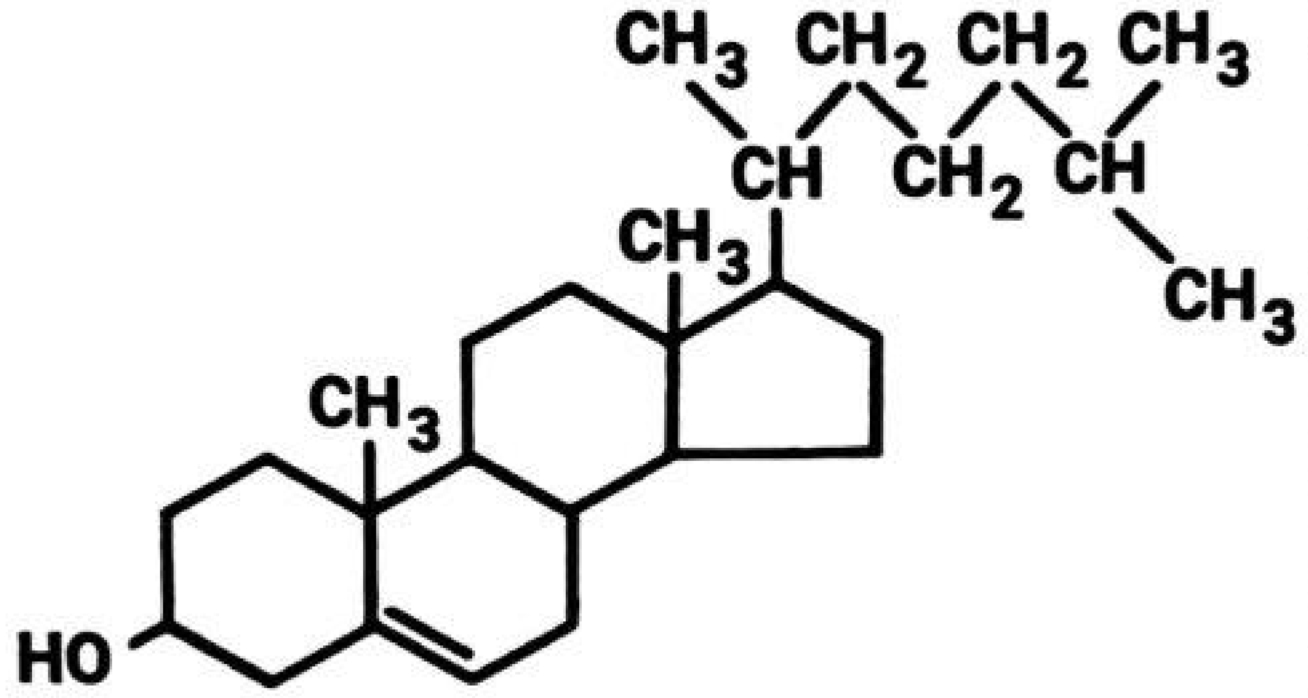
Codes:

	A	B	C	D
1.	U	P	R	Q
2.	T	S	P	R
3.	T	P	S	R
4.	P	Q	R	S

120 Assuming they all had the same number of carbon atoms, which of the following has the most C-H bonds?

1. an unsaturated fat
2. a polyunsaturated fat
3. a polysaccharide
4. a saturated fat

121 Given below is the structure of a lipid. The excess of this compound in human blood can lead to:

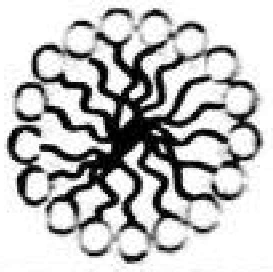
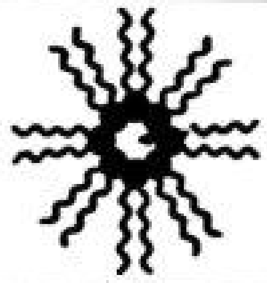
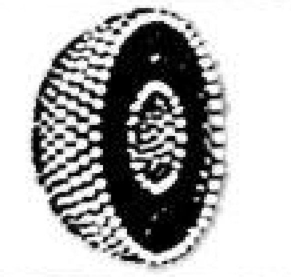
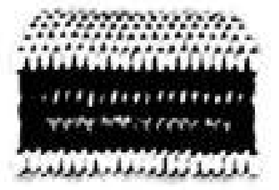


1.	Alzheimer's disease	2.	Phenylketonuria
3.	Atherosclerosis	4.	Rheumatoid arthritis

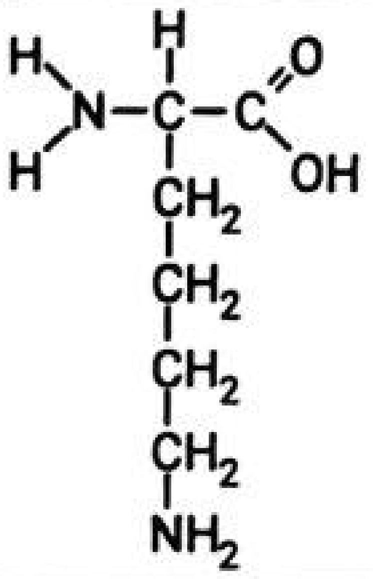
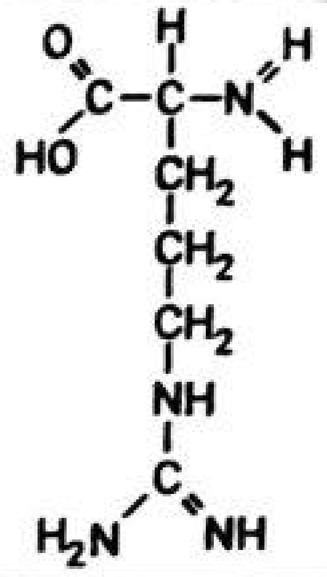
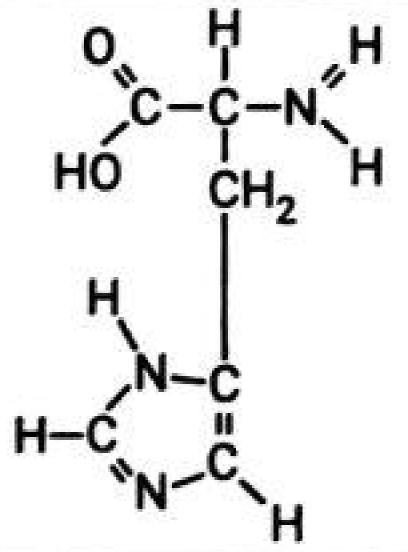
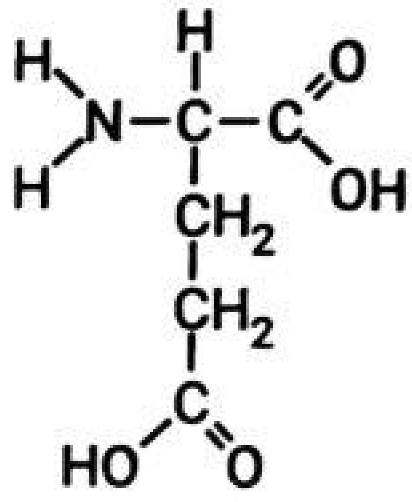
122 The number of water molecules needed to hydrolyze a polymer made of 51 monomers will be:

1. 1	2. 25
3. 50	4. 51

123 Which of the following diagrams represents the 'micelle' formation by amphiphilic molecules in a non polar organic solvent?

1.		2.	
3.		4.	

124 Identify an acidic amino acid amongst the following:

1.		2.	
3.		4.	

125 Consider the given statements regarding some important secondary metabolites:

I:	Morphine is a strong opiate that is found naturally in opium and is mainly used as a pain medication.
II:	Ricin is a toxin and a highly potent toxin produced in the seeds of the castor oil plant.
III:	Concanavalin A is a lectin and is widely used in biology and biochemistry to characterize glycoproteins and other sugar-containing entities on the surface of various cells.
IV:	Vinblastin is an anti-cancer drug typically used with other medications, to treat a number of types of cancer.

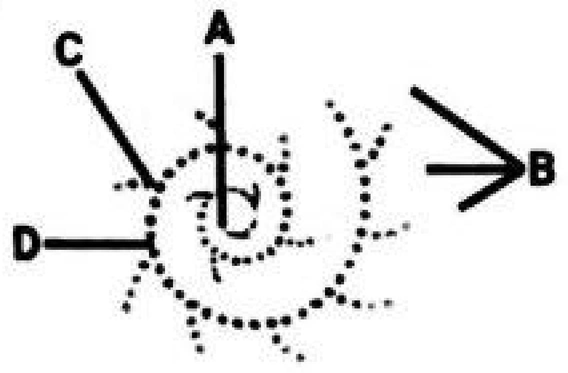
1. Only I, II and III are correct
2. Only I, III and IV are correct
3. Only II, III and IV are correct
4. I, II, III and IV are correct

126 Consider the given two statements:

I:	Arachidonic acid is a conditionally essential fatty acid.
II:	It does become essential if a deficiency in linoleic acid exists.

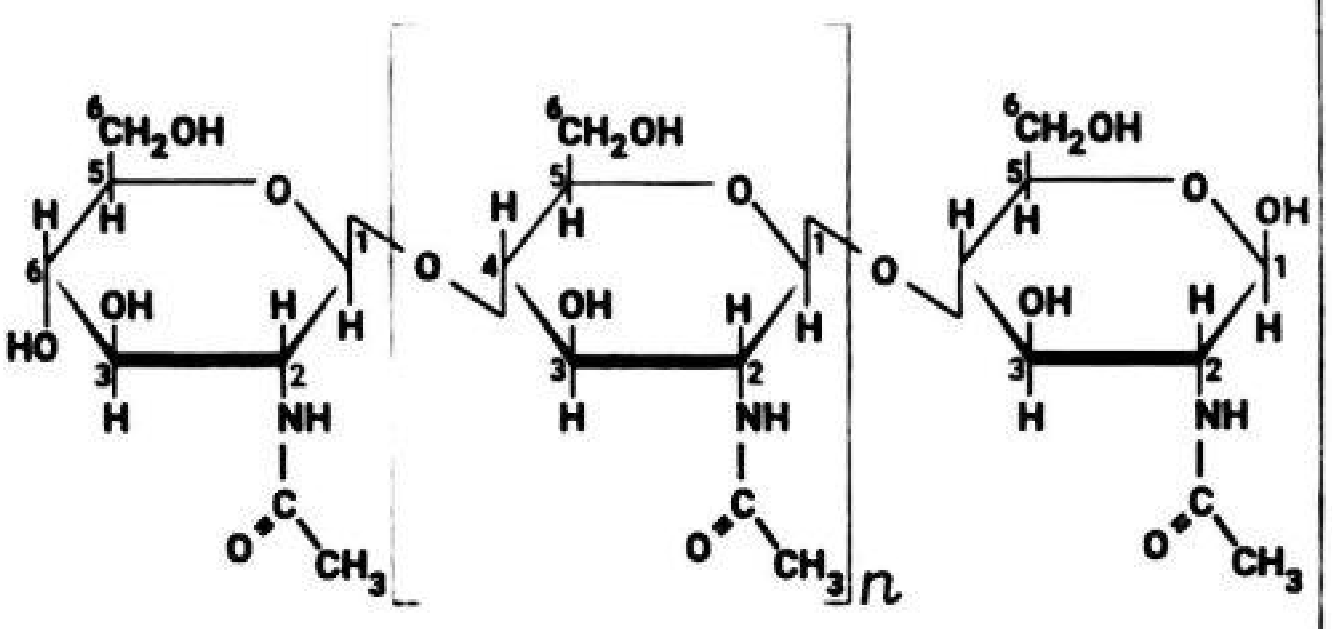
1. Both I and II are correct and II explains I
2. Both I and II are correct but II does not explain I
3. I is correct and II is incorrect
4. Both I and II are incorrect

127 The given figure represents structure of glycogen/amylopectin. Identify A, B, C and D:



	A	B	C	D
1.	Reducing end	Non reducing end	α [1→4] linkage	α [1→6] linkage
2.	Non reducing end	Reducing end	α [1→4] linkage	α [1→6] linkage
3.	Reducing end	Non reducing end	α [1→6] linkage	α [1→4] linkage
4.	Non reducing end	Reducing end	α [1→6] linkage	α [1→4] linkage

128 Identify the biopolymer show in the diagram and the constituent monomer shown within the brackets:

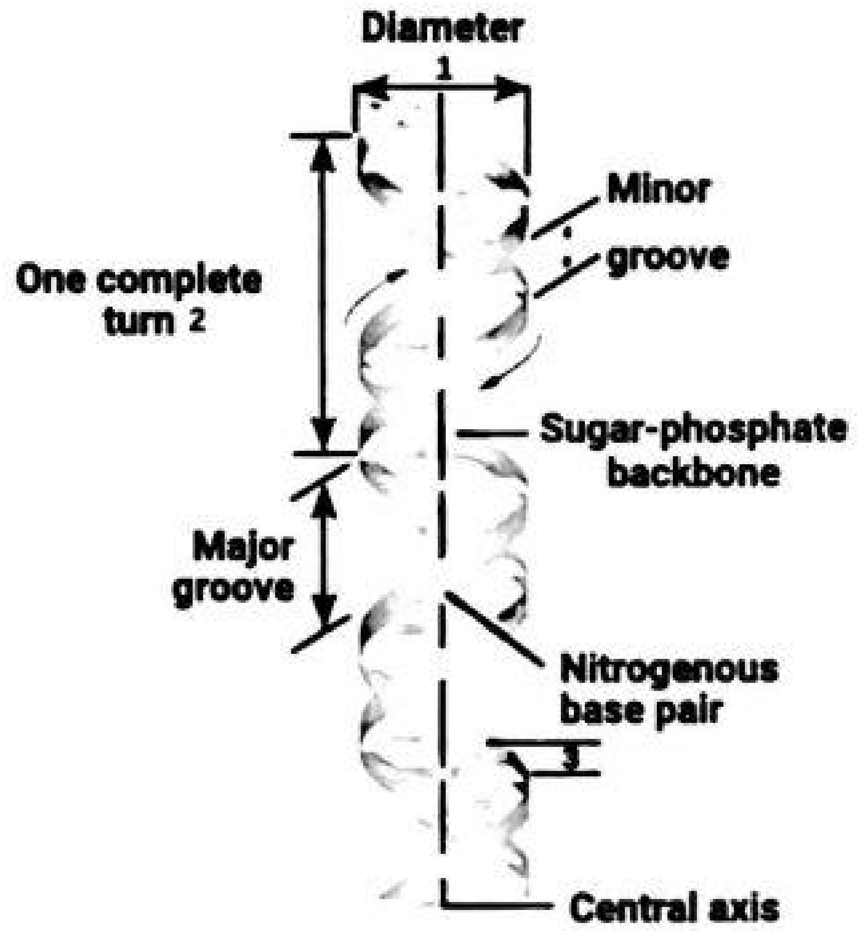

⁶CH₂OH
O
OH
HO
H
NH
C
O
CH₃
n

1. Cellulose and β – D Glucose
2. Agarobiose and 3,6-anhydro-L-galactopyranose
3. Chitin and N-acetyl-D-glucosamine
4. Peptidoglycan and N-acetylmuramic acid

129 Cellulose, the most important constituent of plant cell wall, is made of

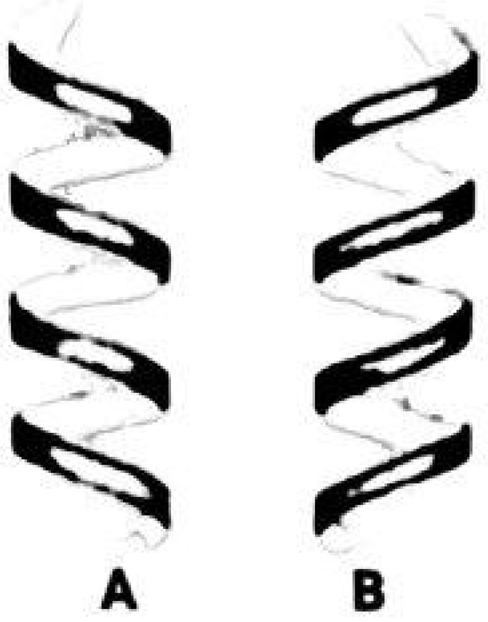
1.	Unbranched chain of glucose molecules linked by α 1, 4 glycosidic bond
2.	Branched chain of glucose molecules linked by β 1, 4 glycosidic bond in straight chain and β 1, 6 glycosidic bond at the site of branching
3.	Unbranched chain of glucose molecules linked by β 1, 4 glycosidic bond
4.	Branched chain of glucose molecules linked by α 1, 6 glycosidic bond at the site of branching

130 In the given diagram of DNA double helix, what would be the correct values of 1, 2, and 3 in nanometre?


Diameter
1
Minor groove
One complete turn 2
Sugar-phosphate backbone
Major groove
Nitrogenous base pair
3
Central axis

	1	2	3
1.	1.0	3.4	34
2.	2.0	0.34	3.4
3.	2.0	3.4	0.34
4.	4.0	3.4	0.34

131 In the given diagram showing two helices A and B:



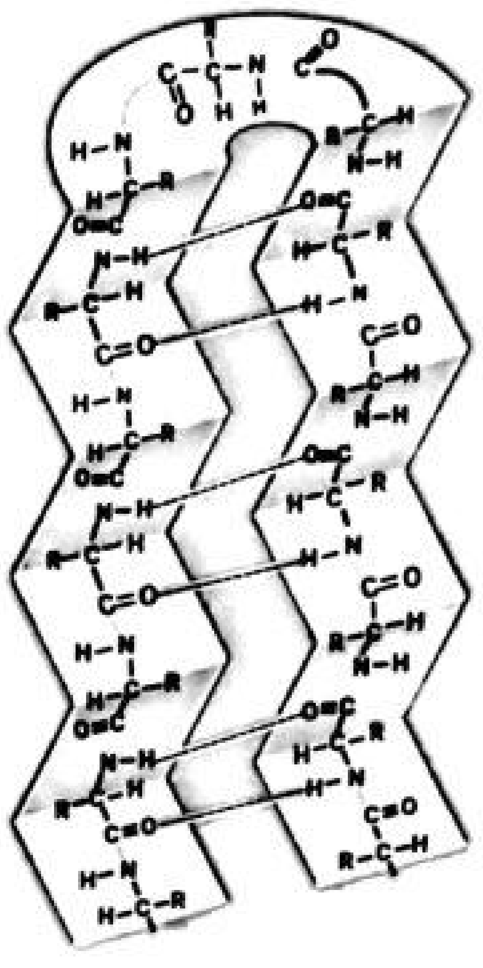
1. A is left handed helix and B is right handed helix
2. A is right handed helix and B is left handed helix
3. Both are right handed helices
4. Both are left handed helices

132 Consider the given two statements:

I:	Any exposure to extreme stresses can disrupt a protein's interaction and inevitably lead to denaturation.
II:	Protein folding consists of a balance between a substantial amount of weak intra-molecular interactions within a protein.

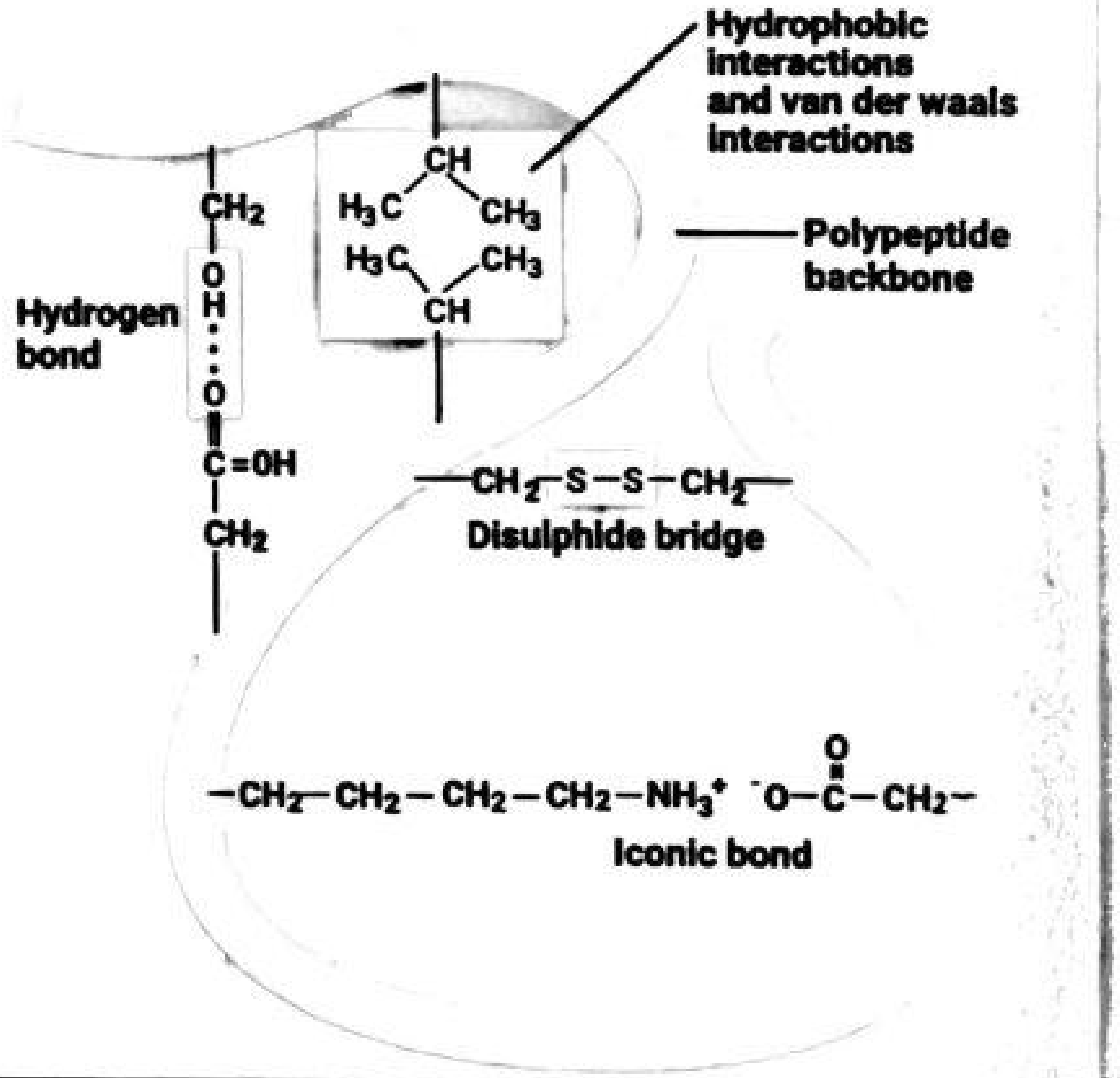
1. Both I and II are correct and II explains I
2. Both I and II are correct but II does not explain I
3. I is correct and II is incorrect
4. Both I and II are incorrect

133 Shown below is a level of structural organization of a protein. Which of the following proteins attains its final form as this structure?



1. Keratin	2. Fibroin
3. Tropo-collagen	4. Myoglobin

134 What level of protein structure is shown in the given diagram?

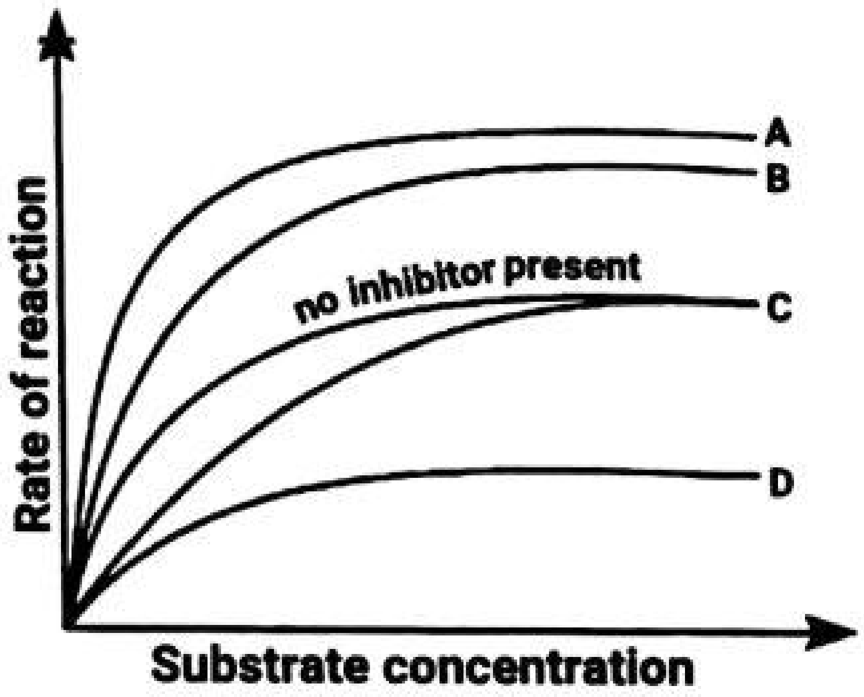

Hydrophobic interactions and van der waals interactions
Polypeptide backbone
Hydrogen bond
CH₂
O
H
O
C=OH
CH₂
CH
H₃C CH₃
H₃C CH₃
CH
—CH₂—S—S—CH₂—
Disulphide bridge
—CH₂—CH₂—CH₂—CH₂—NH₃⁺ ⁻O—C—CH₂—
O
Iconic bond

1. Primary	2. Secondary
3. Tertiary	4. Quaternary

135 A change in an amino acid located distantly from the active site of an enzyme can affect the specificity of the enzyme towards its substrate by:

1.	making the enzyme unstable
2.	cause a relocation of the enzyme within a cell
3.	changing the shape of the protein
4.	changing the optimum pH and temperature values for the enzyme

136 If an active-site directed inhibitor is present in the medium, the curve that will represent the progress of the chemical reaction will be shown by the letter:



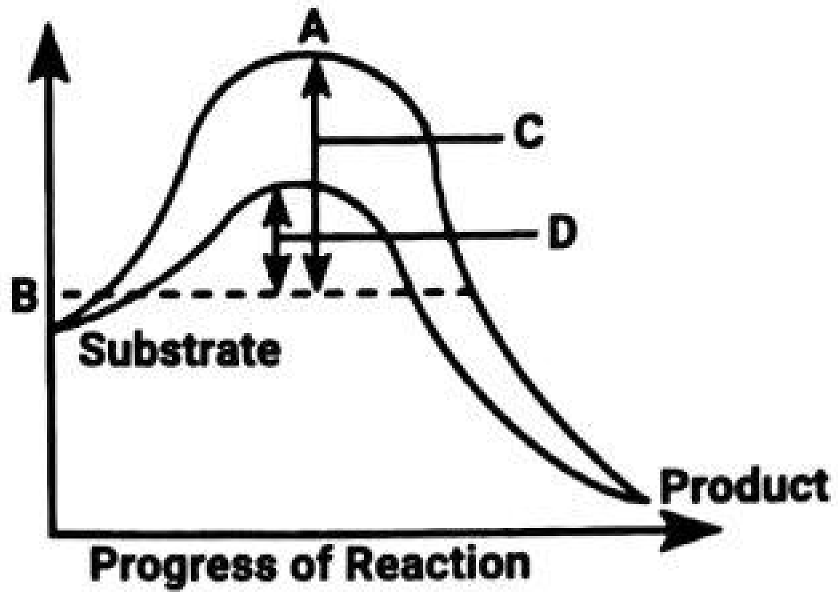
1. D	2. C
3. A	4. B

137 Consider the given two statements:

I:	Living organisms defy the Second Law of Thermodynamics.
II:	They are able to increase their level of organization.

1. Both **I** and **II** are correct and **II** explains **I**
2. Both **I** and **II** are correct but **II** does not explain **I**
3. **I** is correct and **II** is incorrect
4. Both **I** and **II** are incorrect

138 The figure given below shows the conversions of a substrate into product by an enzyme. In which one of the four options (1-4), the components of the reaction labelled as A, B, C and D are identified correctly:



Options

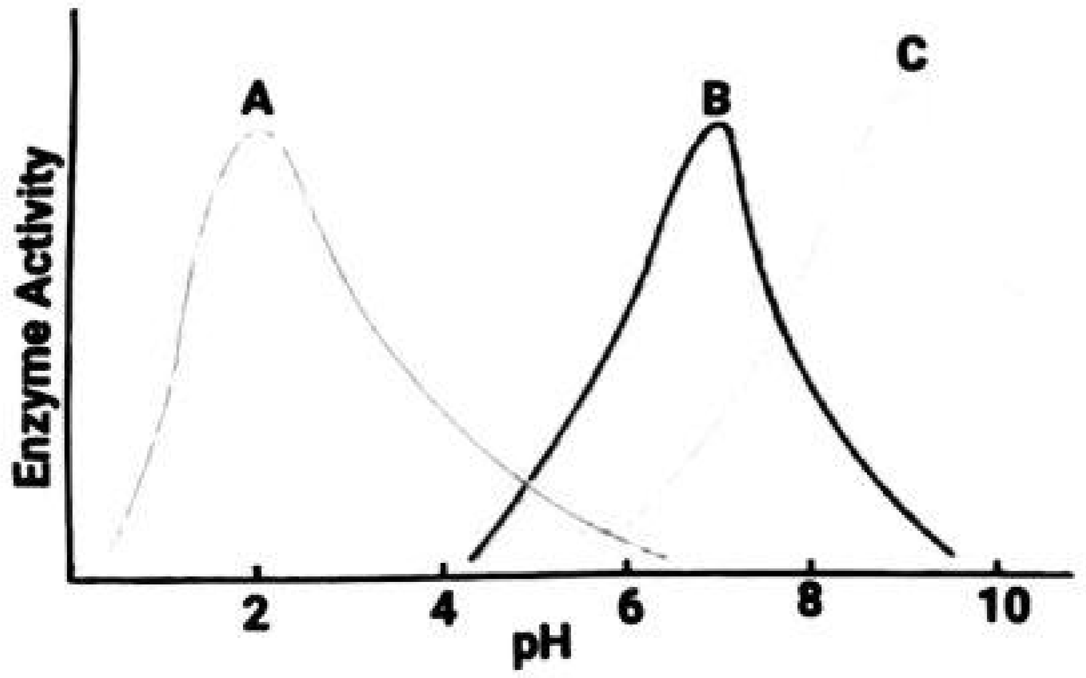
	A	B	C	D
1.	Transition state	Potential energy	Activation energy without enzyme	Activation energy with enzyme
2.	Potential energy	Transition state	Activation energy with enzyme	Activation energy without enzyme
3.	Activation energy with enzyme	Transition state	Activation energy without enzyme	Potential energy
4.	Potential energy	Transition state	Activation energy without enzyme	Activation energy with enzyme

139 Which of the following categories of enzyme classification are correctly matched?

EC 1	Oxidoreductases: catalyze oxidation/reduction reactions
EC 2	Hydrolases: catalyze the hydrolysis of various bonds
EC 3	Transferases: transfer a functional group (e.g. a methyl or phosphate group)
EC 4	Lyases: cleave various bonds by means other than hydrolysis and oxidation
EC 5	Isomerases: catalyze isomerization changes within a single molecule
EC 6	Ligases: join two molecules with covalent bonds.

1. EC 1, EC 4, EC 5 and EC 6 only
2. EC 2 and EC 3 only
3. EC 1, EC 4 and EC 6 only
4. EC 3, EC 4, EC 5 and EC 6 only

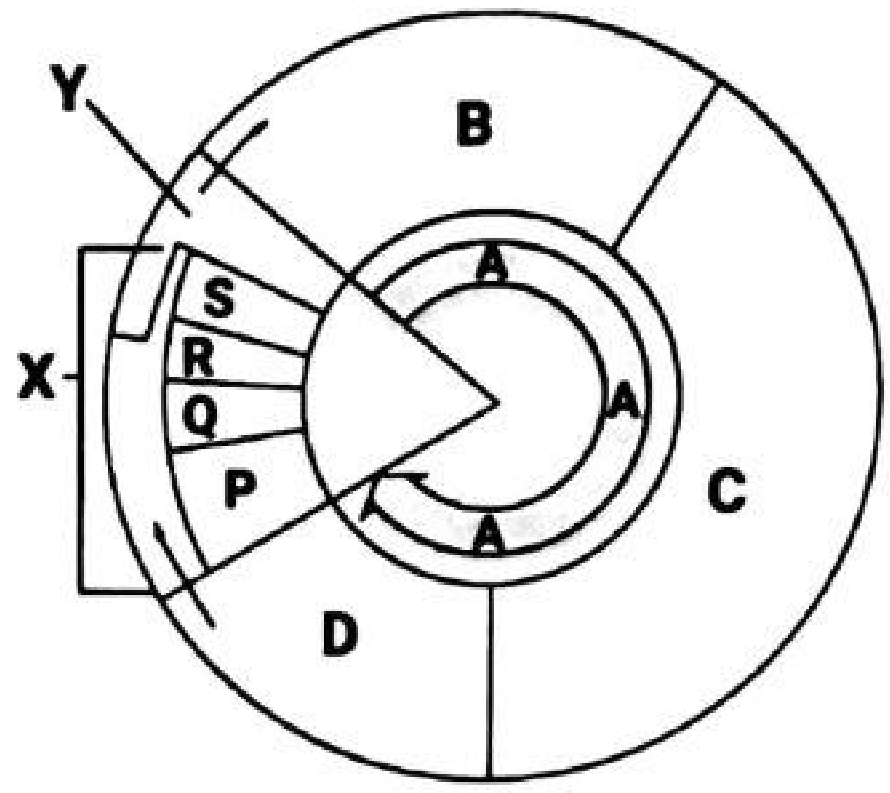
140 Enzymes A, B and C in the given figure can be:



	A	B	C
1.	Gastric lipase	Salivary amylase	Lingual lipase
2.	Pepsin	Salivary amylase	Trypsin
3.	Pepsin	Trypsin	Lactase
4.	Rennin	Maltase	Sucrase

CELL CYCLE AND CELL DIVISION

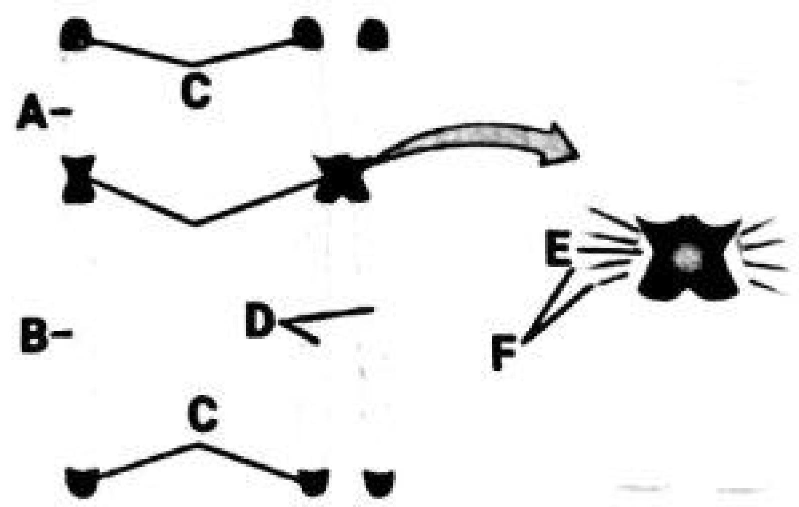
141 The diagram shows the various phases of cell cycle in a typical eukaryotic cell. Identify the correct match:



I:	A-Interphase; B-G_1 phase; C-S phase; D-G_2 phase
II:	P-Prophase; Q- Anaphase; R-Metaphase; S-Diakinesis
III:	X-Karyokinesis; Y- Cytokinesis

1.	Only III	2.	Only I and III
3.	Only II	4.	I, II and III

142 Identify the correct match for the parts labeled A – F in the given diagram:



	A	B	C	D	E	F
1.	P arm	Q arm	Telomere	Non sister chromatids	Centrosome	Spindle microtubules
2.	Q arm	P arm	Secondary constriction	Sister chromatids	Kinetochore	Polar microtubules
3.	P arm	Q arm	Telomere	Sister chromatids	Kinetochore	Spindle microtubules
4.	Q arm	P arm	Primary constriction	Non Sister chromatids	Centromere	Spindle microfilaments

143 Consider the given two statements:

I:	Most adult neuronal cells in humans reside in a terminal G_0 phase.
II:	The adult neuronal cells are not very active metabolically and are not differentiated to a higher degree.

1. Both I and II are correct and II explains I
2. Both I and II are correct but II does not explain I
3. I is correct and II is incorrect
4. Both I and II are incorrect

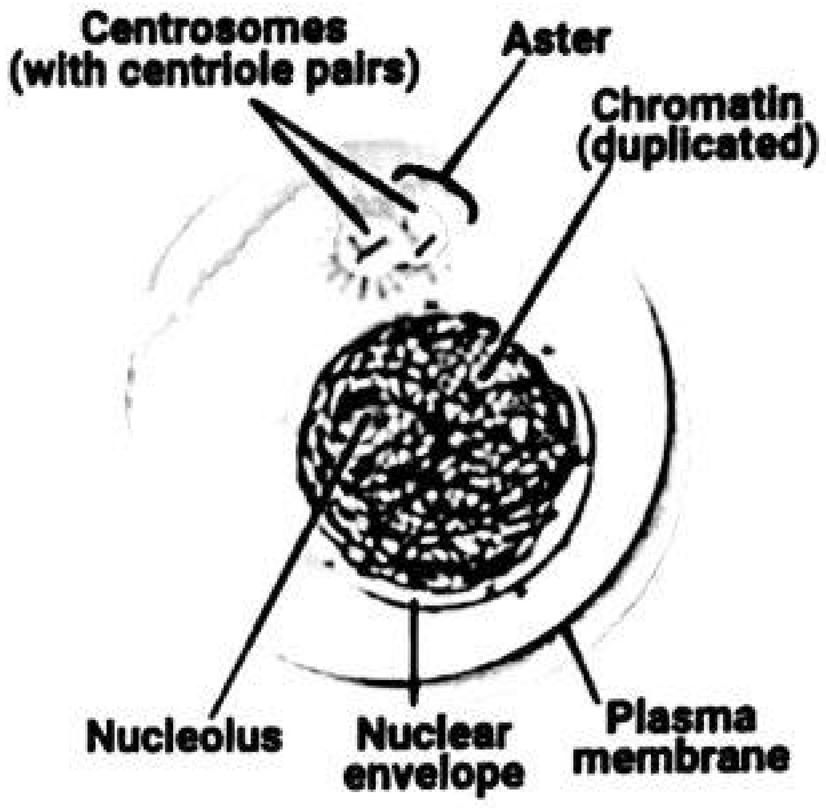
144 During what phase in the cell cycle would you find the most DNA per cell?

1. G_1	2. G_2
3. S	4. Prophase II

145 The phase of the cell cycle that is expected to be the most variable in duration in different types of cells in an animal will be:

1. G_1	2. S
3. G_2	4. M

146 At which stage of the cell cycle is the cell shown in the given diagram?



1. G_1	2. S
3. G_2	4. M

147 The cell expected to go through the events of cell cycle in the least amount of time would be:

1. Epithelial cell in humans	2. Neuron in humans
3. Yeast cell	4. *Escherichia coli*

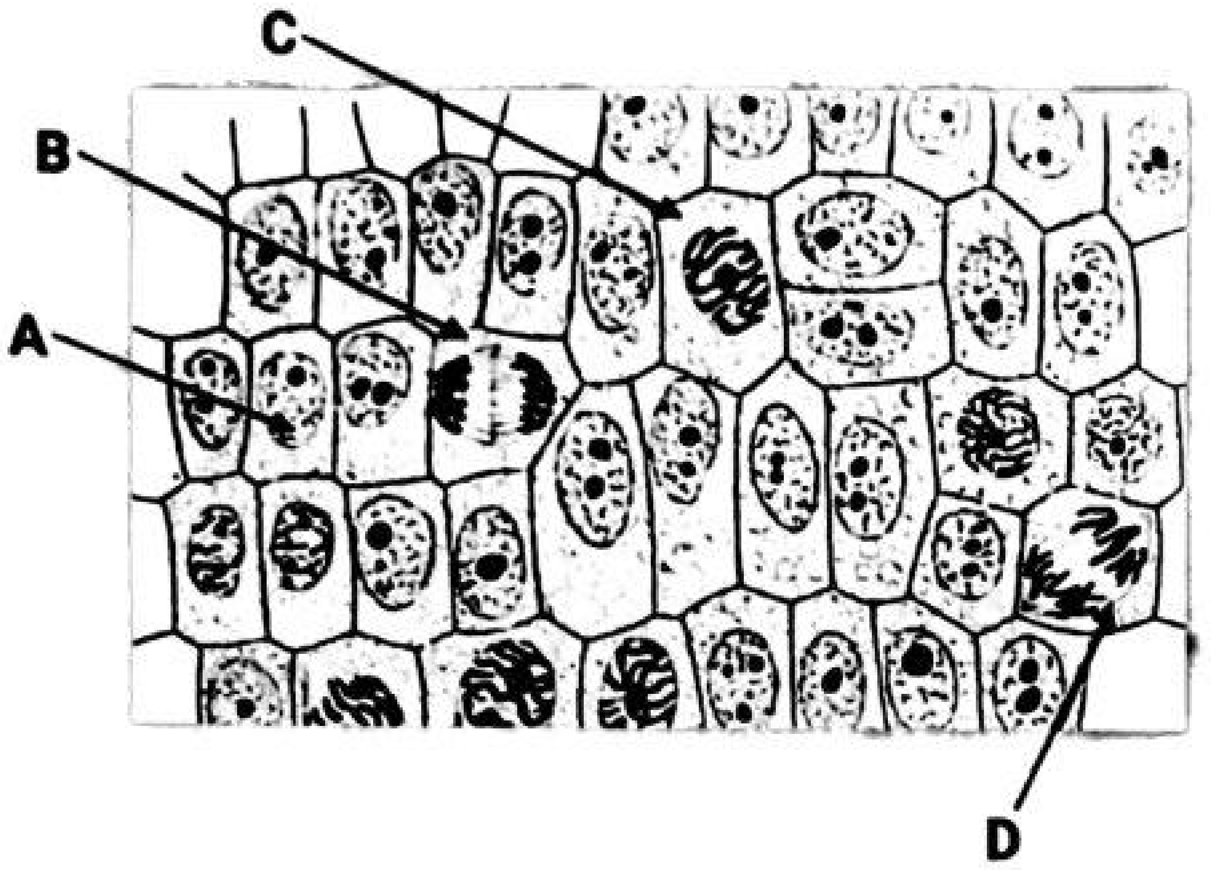
148 Consider the following functions:

I:	Replication of DNA along with the synthesis of nuclear proteins such as histones
II:	Duplication of centriole
III:	Synthesis of energy rich compounds and proteins

Which of the above functions are carried out by a plant cell before it divides?

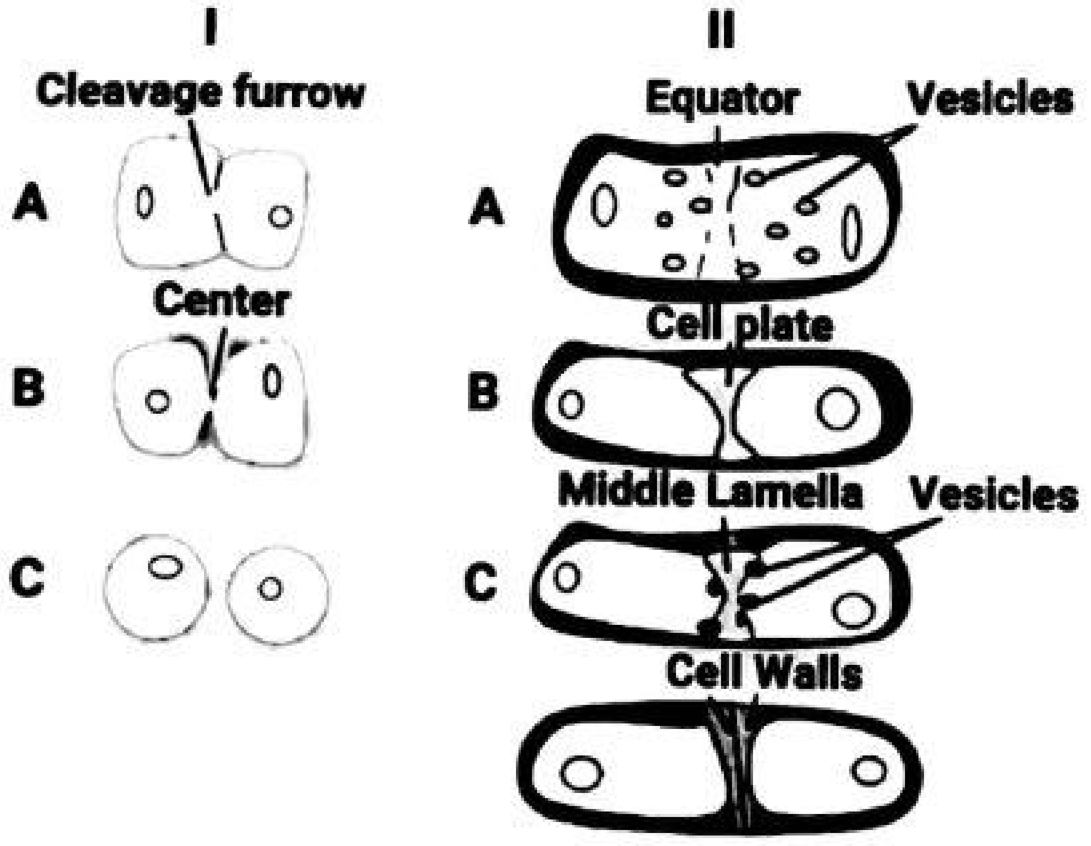
1.	I only	2.	I, and II
3.	I and III	4.	I, II and III

149 The given diagram shows a slide with cells labeled as A, B, C and D at different stages of cell division. Identify the correct match:



	A	B	C	D
1.	Interphase	Telophase	Prophase	Anaphase
2.	Interkinesis	Anaphase	Prophase	Metaphase
3.	Interkinesis	Telophase	Metaphase	Anaphase
4.	Interphase	Prophase	Metaphase	Anaphase

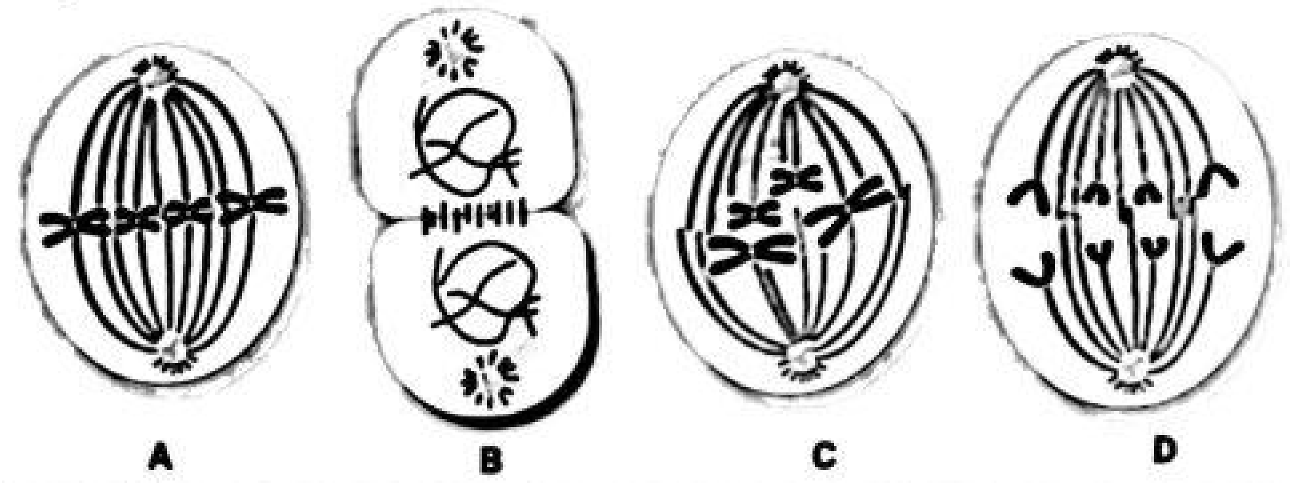
150 The diagram shows cytokinesis in animal cell [I] and in plant cell [II]. What will be correct for A, B and C in these cells?



	Animal cell	Plant cell
A.	Furrow formed using actin and myosin	Vesicles from Golgi move to centre
B.	The furrow reaches centre from periphery	Tubular structures merge to form plasma membrane
C.	Cells pinched apart	Pectins deposited leading to formation of middle lamella

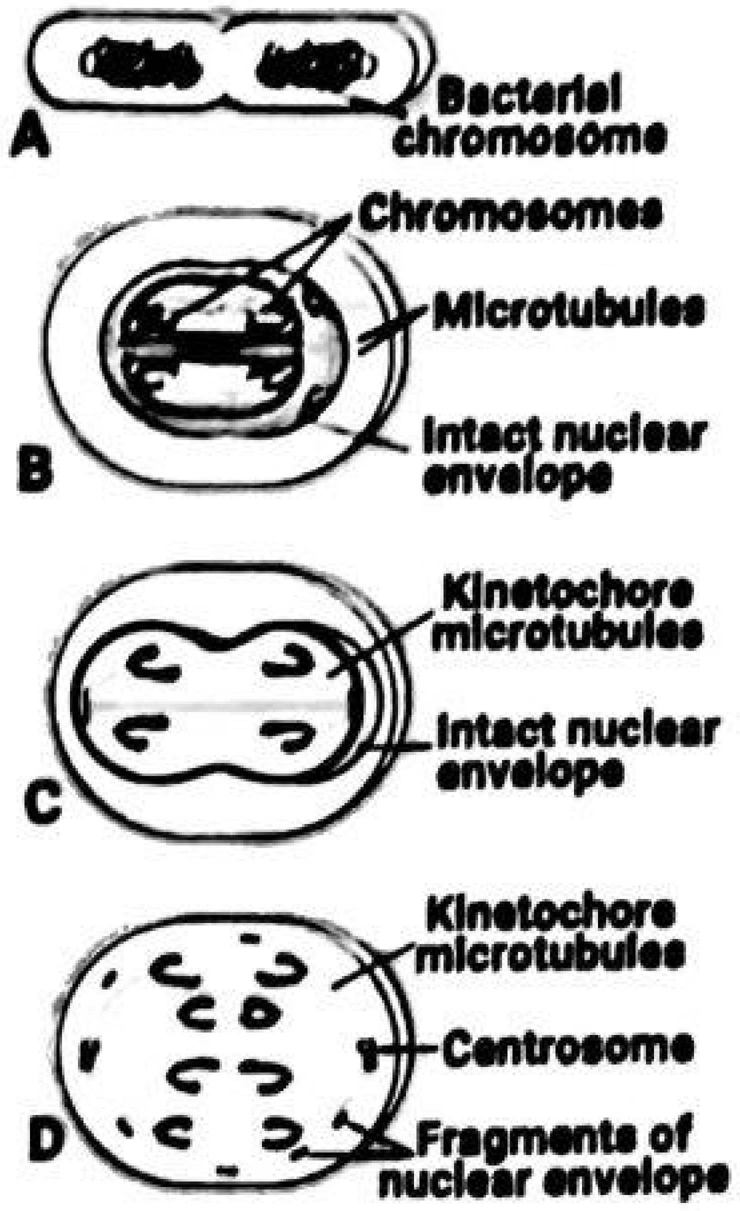
1.	Only **A** and **B**	2.	Only **A** and **C**
3.	Only **B** and **C**	4.	**A, B** and **C**

151 The given diagram shows the various stages that occur in mitotic division in a typical eukaryotic animal cell. Identify the correct chronological sequence in which they occur:



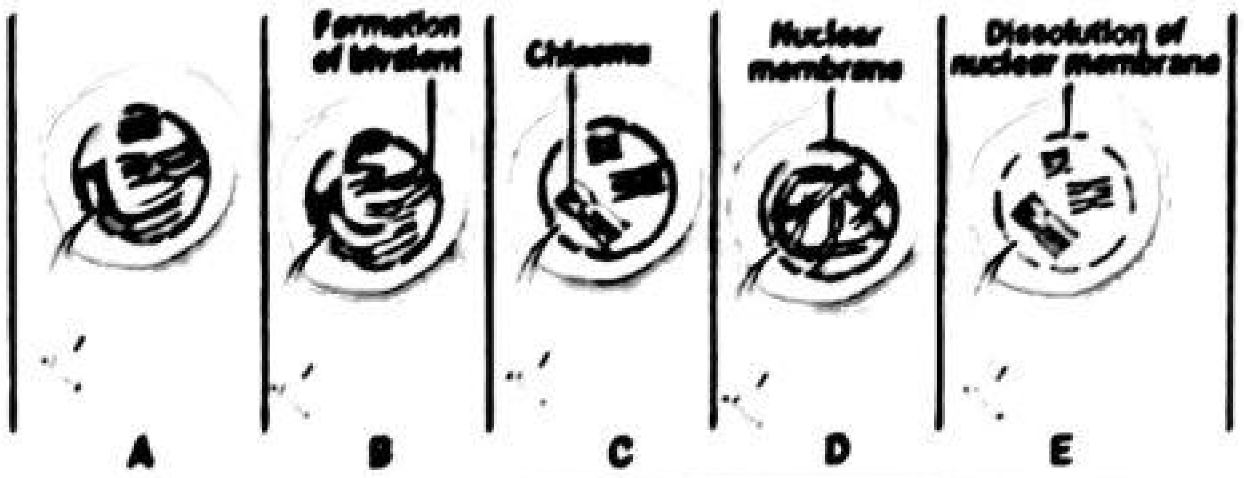
1.	A → B → C → D
2.	C → A → D → B
3.	D → A → C → B
4.	B → A → D → C

152 The diagram given shows a hypothetical scheme of evolution of mitosis. A, B, C and D are evidences for this evolution scheme from living organisms, for example, A represents bacteria where binary fission is considered as a precursor of mitosis. Identify B, C and D:


A
Bacterial chromosome
B
Chromosomes
Microtubules
Intact nuclear envelope
C
Kinetochore microtubules
Intact nuclear envelope
D
Kinetochore microtubules
Centrosome
Fragments of nuclear envelope

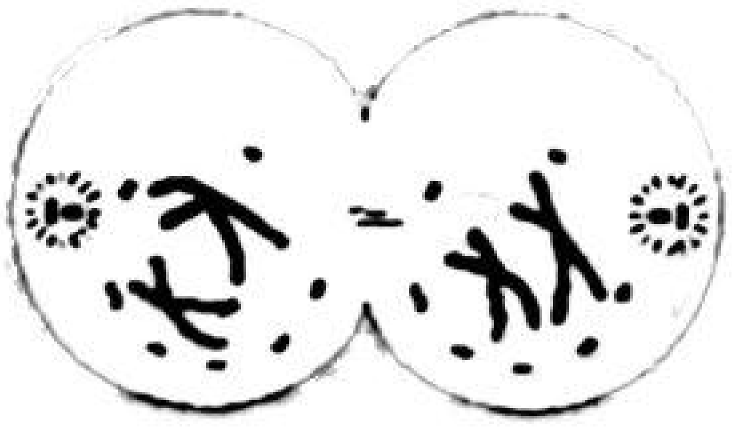
	B	C	D
1.	Dinoflagellates	Diatoms	Eukaryotes
2.	Diatoms	Euglenoids	Eukaryotes
3.	Yeasts	Dinoflagellates	Archaebacteria
4.	Diatoms	Dinoflagellates	Eukaryotes

153 The given diagram shows the various stages that occur in Prophase I of the first meiotic division. Identify the correct chronological sequence in which they occur:


Formation of bivalent
Chiasma
Nuclear membrane
Dissolution of nuclear membrane
A
B
C
D
E

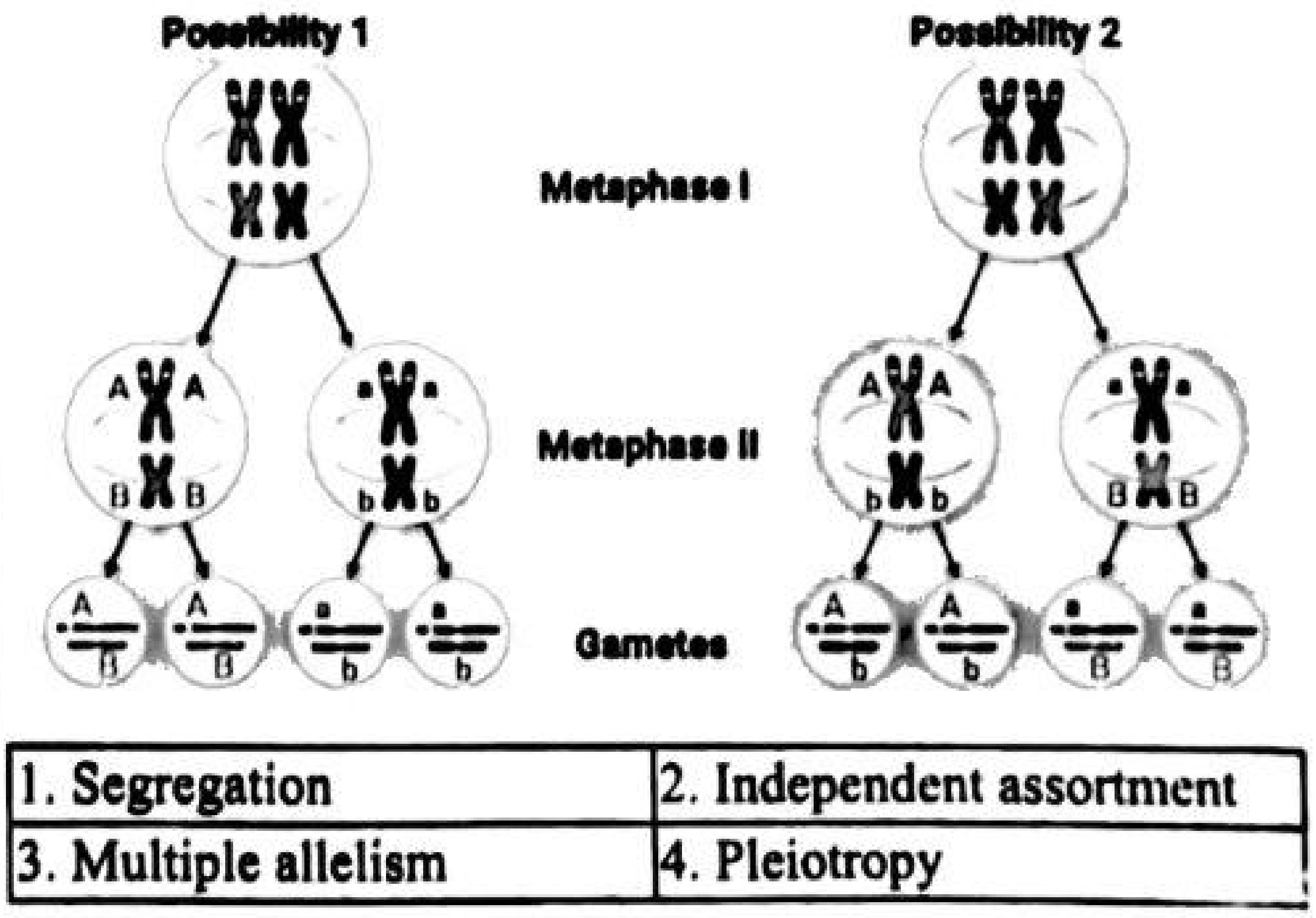
1.	A → B → C → D → E
2.	D → B → A → C → E
3.	D → B → C → E → A
4.	A → B → D → C → E

154 Identify the stage of meiotic cell division shown in the given diagram:



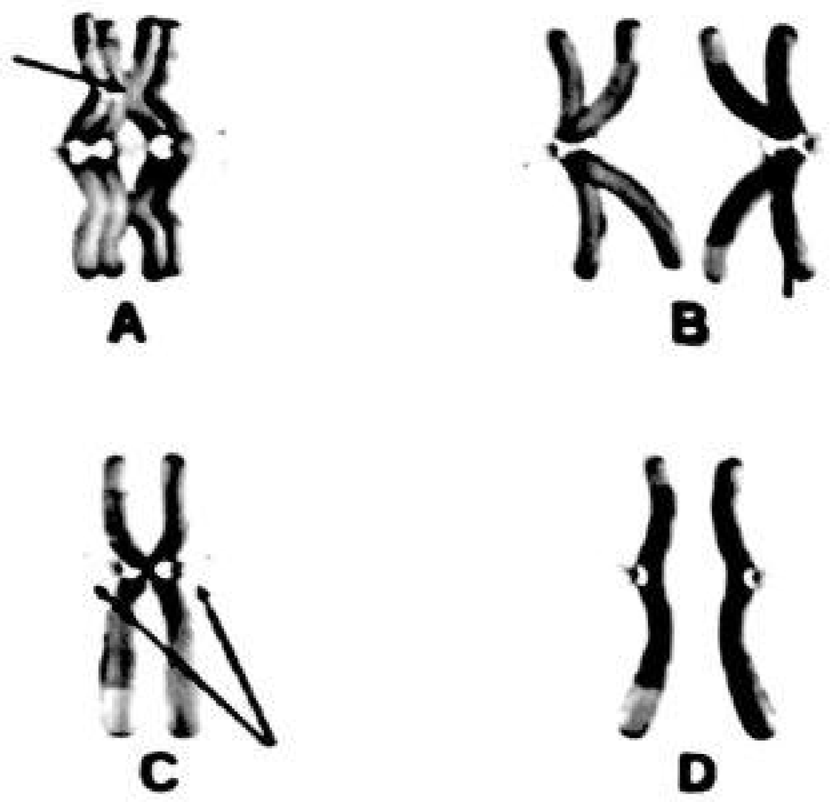
1.	Anaphase I	2.	Anaphase II
3.	Telophase I	4.	Telophase II

155 The diagram shows two possible arrangements of homologues at metaphase equatorial plate during meiosis and the resultant gametic combinations. This is the physical basis of:


Possibility 1
Possibility 2
Metaphase I
Metaphase II
Gametes
A
a
B
b

1. Segregation	2. Independent assortment
3. Multiple allelism	4. Pleiotropy

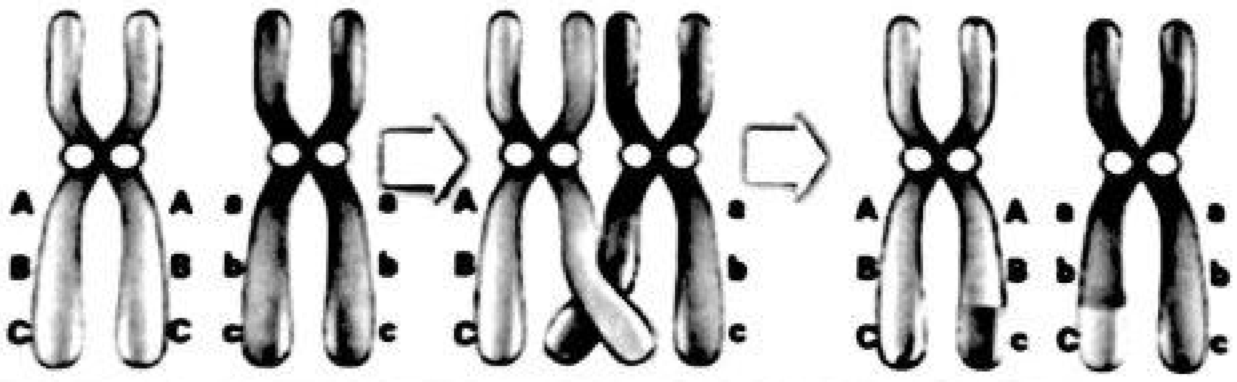
156 A and B in the given diagram are events seen in Meiosis I and C and D are events seen in Meiosis II. Identify the correct match:



A:	Prophase I and arrow shows chiasmata
B:	Anaphase I and arrow shows sister chromatids associated at centromere
C:	Prophase II and arrows show attachment of spindle microtubules to kinetochore
D:	Anaphase II and the diagram shows separated sister chromatids after the split of centromere

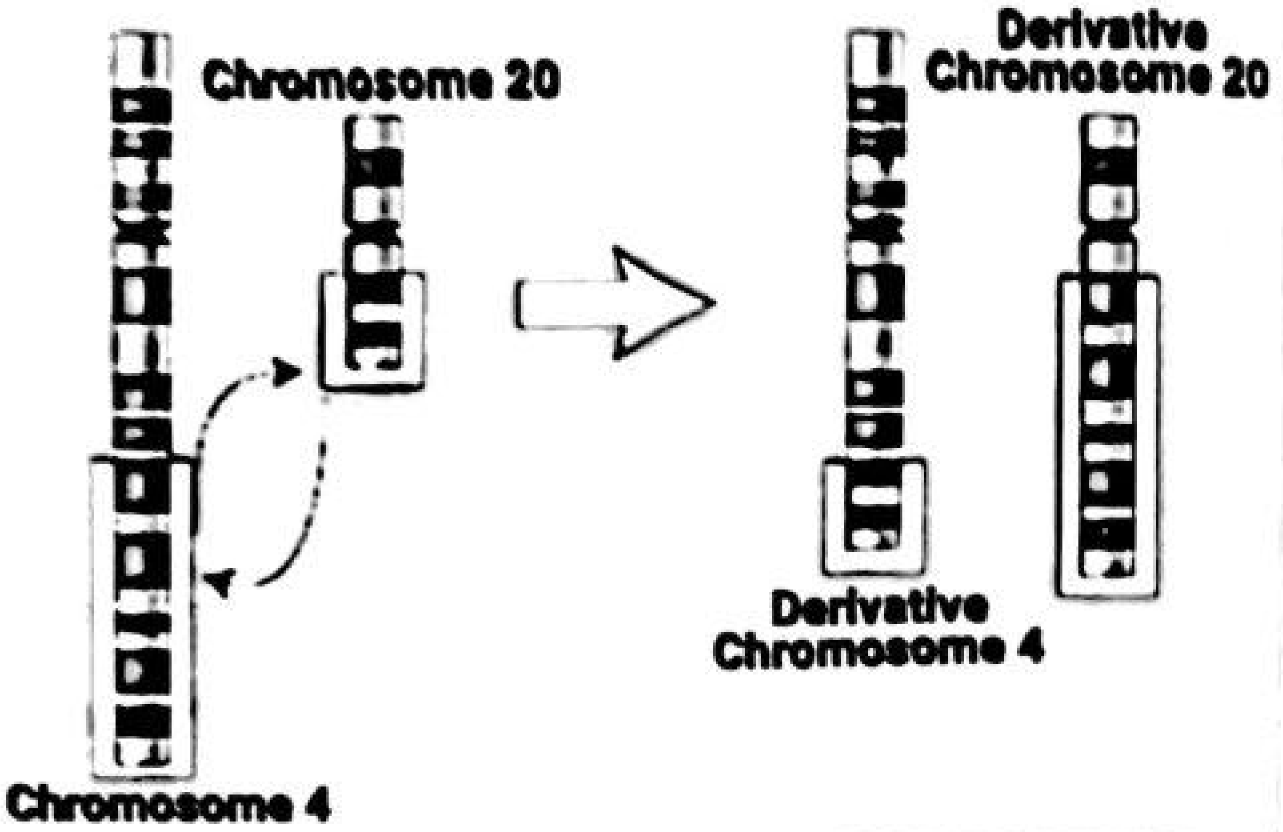
1.	Only A, B and C	2.	Only A, C and D
3.	Only B, C and D	4.	A, B, C and D

157 The event shown in the given diagram takes place during:



1. Pachytene of Prophase I	2. Diplotene of Prophase I
3. Metaphase II	4. Anaphase II

158 The given diagram shows:



1.	Exchange of segments between non-sister chromatids of homologous chromosomes during prophase I of first meiosis.
2.	Exchange of segments between non-sister chromatids of heterologous chromosomes during prophase I of first meiosis.
3.	Reciprocal translocation where there is an exchange of segments between heterologous chromosomes and it is a chromosomal aberration.
4.	Inversion, a chromosome aberration, due to non-disjunction of homologues at first meiosis.

FAT MCQs (UNIT I, II & III) - ANSWER KEY

1.	(4)	2.	(4)	3.	(1)	4.	(2)	5.	(1)	6.	(4)	7.	(3)	8.	(3)	9.	(3)	10.	(2)
11.	(3)	12.	(1)	13.	(1)	14.	(1)	15.	(2)	16.	(4)	17.	(4)	18.	(4)	19.	(1)	20.	(4)
21.	(4)	22.	(1)	23.	(3)	24.	(1)	25.	(3)	26.	(3)	27.	(1)	28.	(1)	29.	(3)	30.	(1)
31.	(3)	32.	(3)	33.	(4)	34.	(3)	35.	(2)	36.	(2)	37.	(2)	38.	(4)	39.	(4)	40.	(3)
41.	(4)	42.	(4)	43.	(4)	44.	(4)	45.	(4)	46.	(1)	47.	(1)	48.	(3)	49.	(2)	50.	(1)
51.	(3)	52.	(2)	53.	(3)	54.	(1)	55.	(2)	56.	(2)	57.	(1)	58.	(2)	59.	(3)	60.	(1)
61.	(2)	62.	(3)	63.	(1)	64.	(2)	65.	(3)	66.	(3)	67.	(1)	68.	(1)	69.	(1)	70.	(1)
71.	(1)	72.	(1)	73.	(3)	74.	(3)	75.	(2)	76.	(3)	77.	(2)	78.	(3)	79.	(3)	80.	(3)
81.	(3)	82.	(4)	83.	(2)	84.	(2)	85.	(1)	86.	(3)	87.	(2)	88.	(4)	89.	(3)	90.	(1)
91.	(2)	92.	(3)	93.	(1)	94.	(1)	95.	(3)	96.	(4)	97.	(3)	98.	(1)	99.	(1)	100.	(1)
101.	(2)	102.	(3)	103.	(3)	104.	(2)	105.	(4)	106.	(2)	107.	(4)	108.	(2)	109.	(1)	110.	(1)
111.	(4)	112.	(3)	113.	(2)	114.	(4)	115.	(3)	116.	(3)	117.	(2)	118.	(4)	119.	(2)	120.	(4)
121.	(3)	122.	(3)	123.	(2)	124.	(4)	125.	(4)	126.	(1)	127.	(3)	128.	(3)	129.	(3)	130.	(3)
131.	(1)	132.	(1)	133.	(2)	134.	(3)	135.	(3)	136.	(2)	137.	(4)	138.	(1)	139.	(1)	140.	(2)
141.	(2)	142.	(3)	143.	(3)	144.	(2)	145.	(1)	146.	(3)	147.	(4)	148.	(3)	149.	(1)	150.	(4)
151.	(2)	152.	(1)	153.	(2)	154.	(3)	155.	(2)	156.	(4)	157.	(1)	158.	(3)				

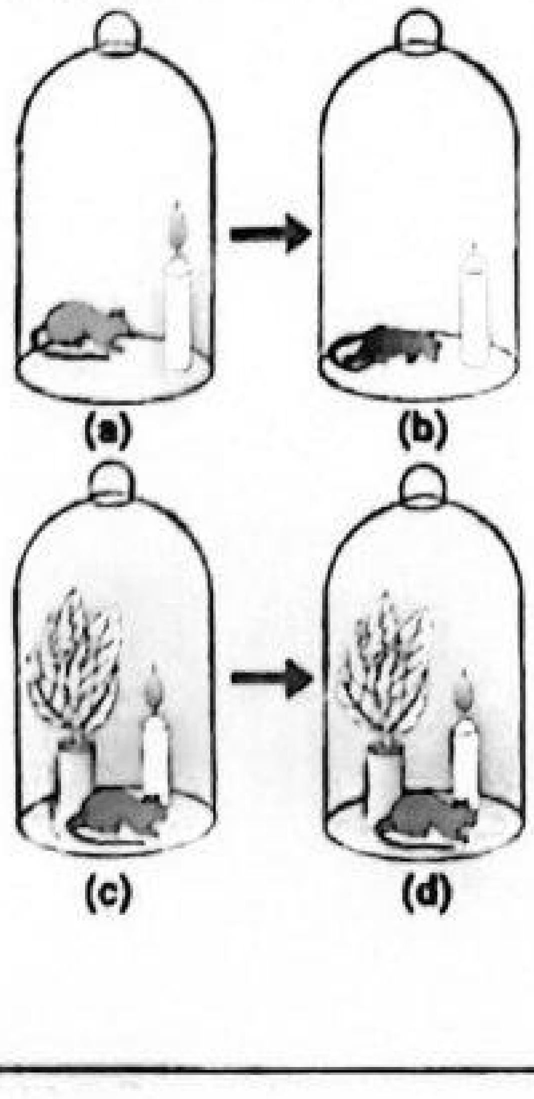
Photosynthesis in Higher Plants

1 Consider the given two statements:

Statement I:	Water molecules appear on both side of the equation for photosynthesis in higher plants.
Statement II:	The water molecules that enter the reaction are not the same molecules that emerge from the reaction.

1.	Both **Statement I** and **Statement II** are correct and **Statement II** explains **Statement I**
2.	Both **Statement I** and **Statement II** are correct but **Statement II** does not explain **Statement I**
3.	**Statement I** is correct and **Statement II** is incorrect
4.	Both **Statement I** and **Statement II** are incorrect

2 Joseph Priestley (1733-1804) in 1770 performed a series of experiments that revealed the essential role of air in the growth of green plants. Priestley observed that a candle burning in a closed space – a bell jar, soon gets extinguished (Figure a, b, c, d). Similarly, a mouse would soon suffocate in a closed space. He concluded that a burning candle or an animal that breathe the air, both somehow, damage the air. But when he placed a mint plant in the same bell jar, he found that the mouse stayed alive and the candle continued to burn.

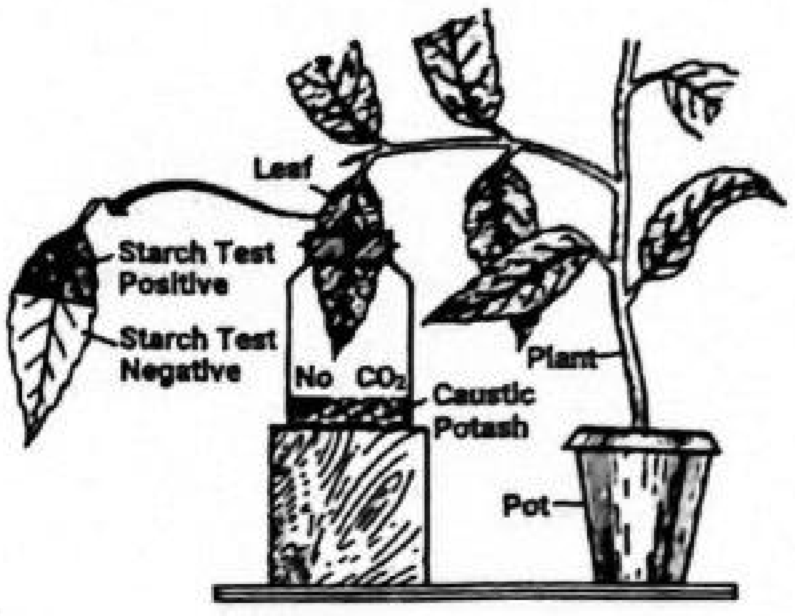


The conclusions that can be drawn from these experiments will be:

I:	Plants restore to the air whatever breathing animals and burning candles remove.
II:	Sunlight is essential to the plant process that somehow purifies the air fouled by burning candles or breathing animals.

1. Only **I**	2. Only **II**
3. Both **I** and **II**	4. Neither **I** nor **II**

3 What conclusions can be drawn from the Moll's half leaf experiment [the given diagram shows the schematic representation of the experiment]?

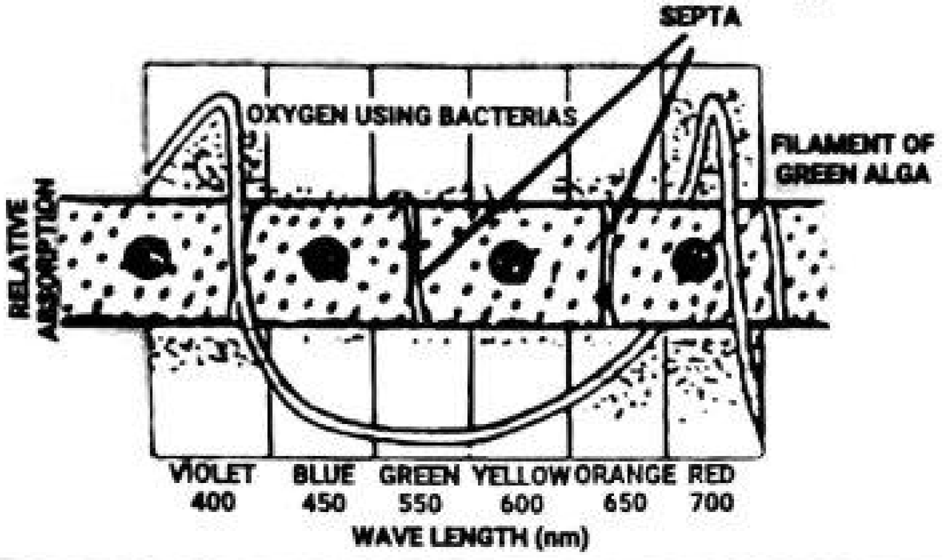


What can be said after observing the results of the experiment?

I:	Negative starch test by the leaf portion present inside the bottle indicates CO 2 is necessary for this process.
II:	Negative test of starch, which is also shown by the portion of the leaf present in between the split of the split cork is due to the lack of CO 2 and light, thus indicating that both of them are essential requirements.

1.	Only **I**	2.	Only **II**
3.	Both **I** and **II**	4.	None

4 The Engelmann experiment shown in the given diagram helped to understand the relationship between:

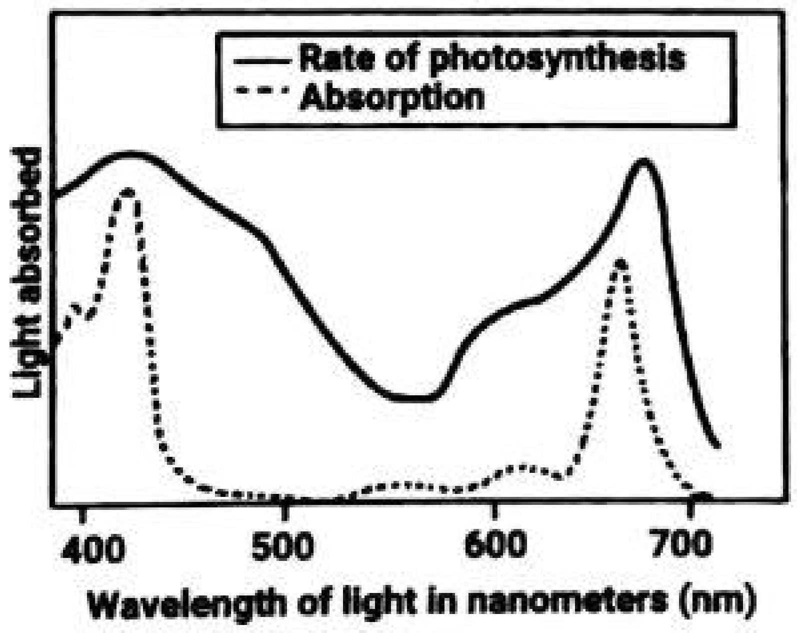


1.	bacteria and the alga used in the experiment.
2.	the rate of respiration in aerobic bacteria and wavelengths of light.
3.	wavelengths of light and the oxygen released during photosynthesis.
4.	rates of oxygen liberation by alga and carbon dioxide liberated by the bacteria.

5 When do you think the chloroplasts will be aligned with their flat surfaces parallel to the walls of the mesophyll cells?

1. In dark
2. When light intensity is low
3. When light intensity is high
4. They are always aligned parallel to the walls

6 Study the given diagram where 'X' represents the absorption spectrum of chlorophyll a and 'Y' represents the action spectrum of photosynthesis. The conclusions that can be drawn include:



I:	Chlorophyll a is the main pigment in photosynthesis.
II:	Violet-Blue and Red wavelengths are very effective for photosynthesis.
III:	Chlorophyll a is the only pigment capable of absorbing light.

1.	I and II only	2.	I and III only
3.	II and III only	4.	I, II and III

7 The relationship between photosynthesis and respiration can be best described as:

1.	Photosynthesis and respiration are reversal of each other in biochemical pathways.
2.	Photosynthesis stores energy in complex organic molecules, while respiration releases it.
3.	Respiration occurs only in animals and photosynthesis occurs only in plants.
4.	Respiration results in formation of ATP but photosynthesis can only use them.

8 The correct statements about photosynthesis include:

I:	the light-dependent reactions can occur only in the light, the light-independent reactions only in the dark
II:	photorespiration is more efficient at producing glucose than is photosynthesis
III:	the light-dependent reactions produce the energy-rich compounds that are used to run the light-independent reactions

1.	I only	2.	III only
3.	I and III only	4.	II and III only

9 The splitting of water during oxygenic photosynthesis in higher plants:

I:	is associated with PS II
II:	releases one molecule of oxygen on splitting of two water molecules
III:	releases protons and oxygen in the thylakoid lumen

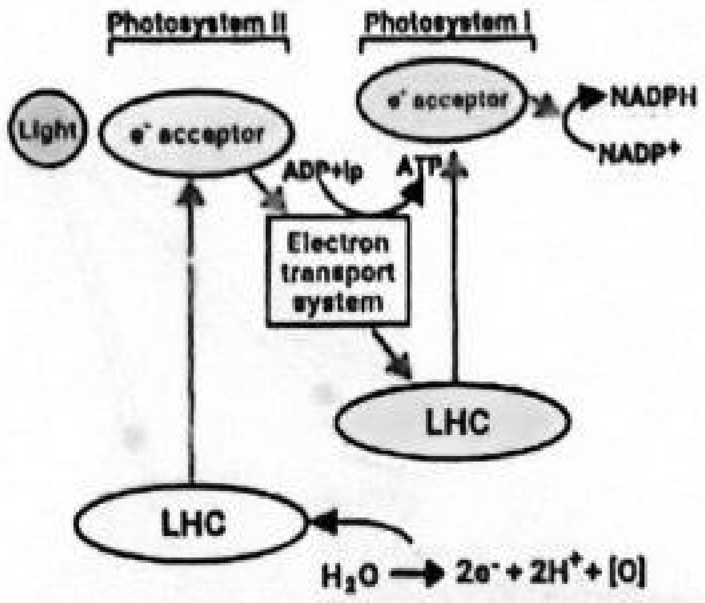
1. Only I and II are correct
2. Only I and III are correct
3. Only II and III are correct
4. I, II and III are correct

10 Consider the following two statements and choose the correct response from the options given below:

I:	Protons and oxygen formed by splitting of water are released in the lumen of thylakoid.
II:	PS II is physically located on the inner side of the membrane of the thylakoid.

1. Both **I** and **II** are true and **II** explains **I**
2. Both **I** and **II** are true but **II** does not explain **I**
3. **I** is true and **II** is false
4. **I** is false and **II** is true

11 What would be true for the sequence of events shown in the given diagram:



I:	The whole scheme of transfer of electrons, starting from the PS II, uphill to the acceptor, down the electron transport chain to PS I, excitation of electrons, transfer to another acceptor, and finally down-hill to NADP+ reducing it to NADPH + H^+ is called the Z scheme.
II:	The electrons that are moved from photosystem II get replaced by electrons available due to splitting of water.

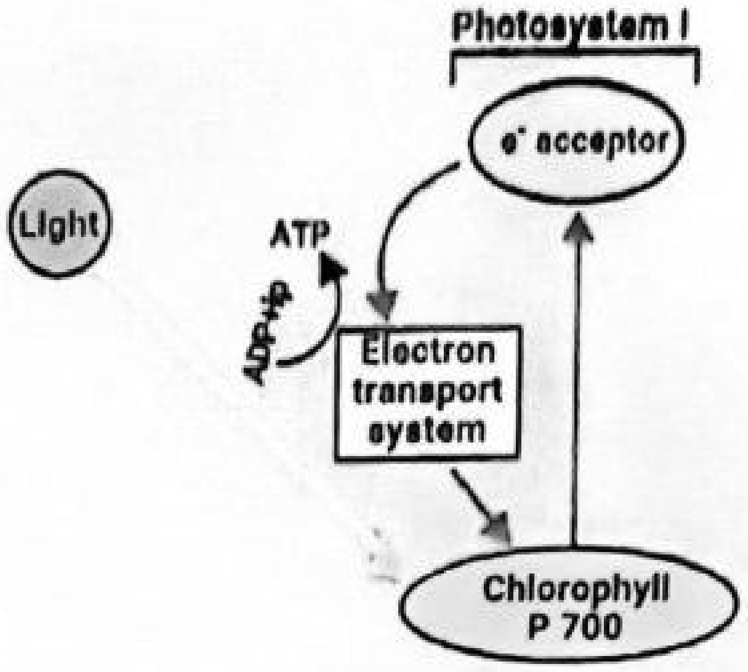
1. Only **I**	2. Only **II**
3. Both **I** and **II**	4. Neither **I** nor **II**

12 The ATP synthase complexes in a plant cell are located:

I:	in the thylakoid membrane
II:	in the plasma membrane
III:	in the inner mitochondrial membrane

1.	**I** and **II** only	2.	**I** and **III** only
3.	**II** and **III** only	4.	**I, II** and **III**

13 What would be true for the events shown in the given diagram?



I:	A possible location where this could be happening is in the stroma lamellae.
II:	While the membrane or lamellae of the grana have both PS I and PS II, the stroma lamellae membranes lack PS II as well as NADP reductase enzyme.

1.	Only **I**	2.	Only **II**
3.	Both **I** and **II**	4.	Neither **I** nor **II**

14 Probably the strongest biological oxidizing agent is P680+ because:

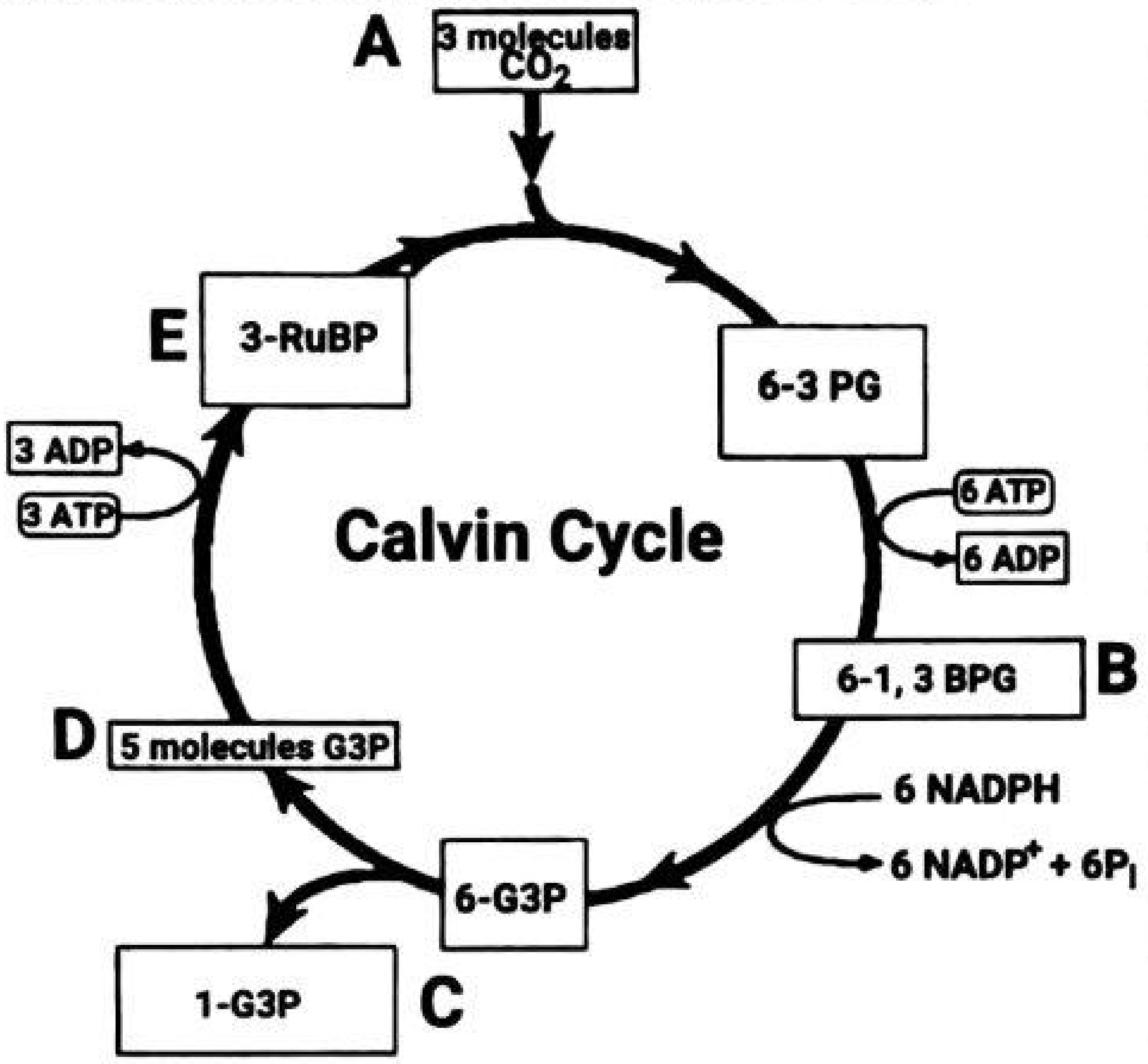
1.	It accepts electron in both photosystems.
2.	It transfers electrons to plastoquinone.
3.	It strongly attracts electrons formed by the splitting of water.
4.	It transfers electrons to plastocyanin.

15 Consider the following two statements regarding RuBisCO:

I:	When carbon dioxide is the substrate, the product of the carboxylase reaction is finally two molecules of glycerate-3-phosphate.
II:	When molecular oxygen is the substrate, the products of the oxygenase reaction are two molecules of phosphoglycolate.

1.	Only **I** is correct	2.	Only **II** is correct
3.	Both **I** and **II** are correct	4.	Both **I** and **II** are incorrect

16 Given below is the schematic diagram of Calvin cycle taking place in a certain plant. ATP used by this plant is radioactively labeled. One turn of the cycle is allowed to happen. Radioactivity would be seen in all except:

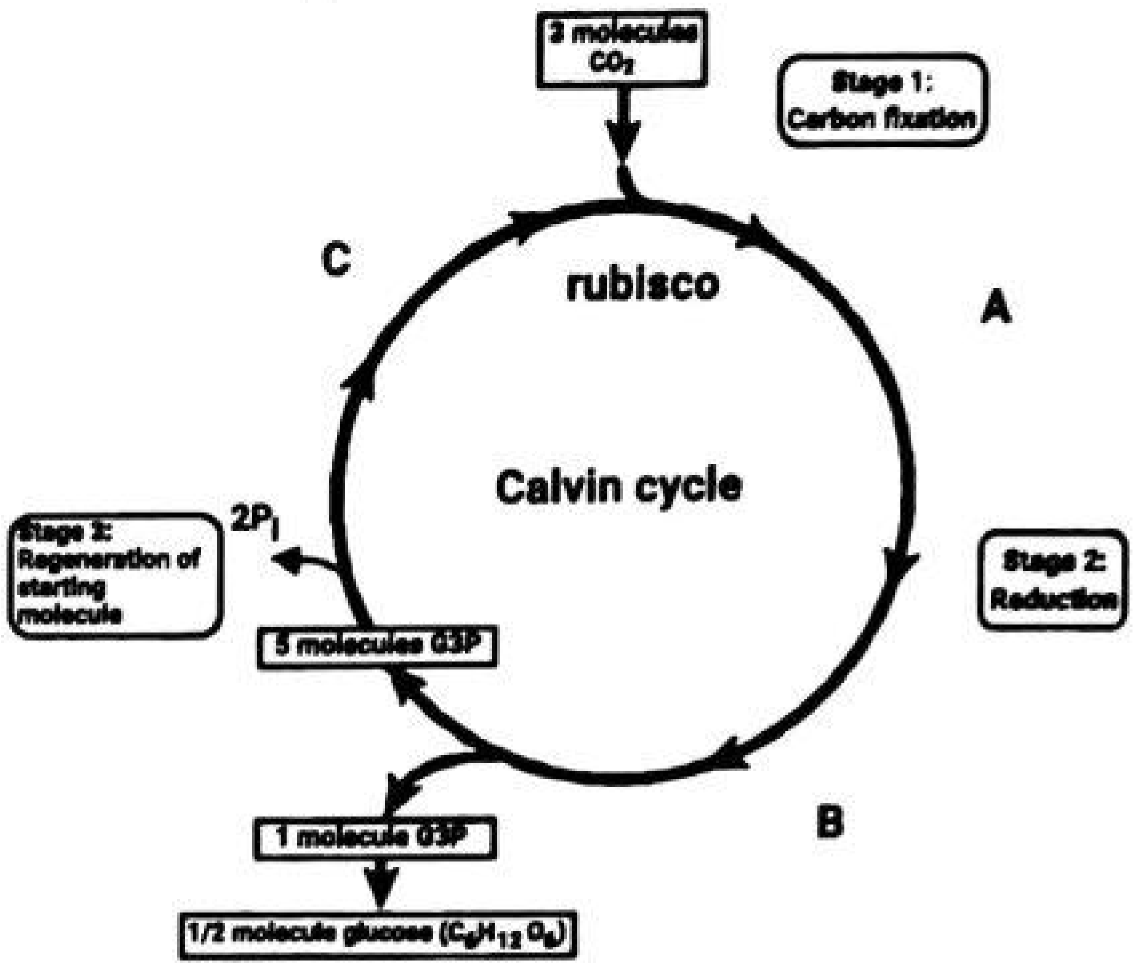

A
3 molecules CO_2
E
3-RuBP
6-3 PG
3 ADP
3 ATP
Calvin Cycle
6 ATP
6 ADP
6-1, 3 BPG
B
D
5 molecules G3P
6 NADPH
6 $NADP^+$ + $6P_i$
6-G3P
1-G3P
C

1. A
2. B
3. C and D
4. E

17 NCERT textbook mentions that "immediately after light becomes unavailable, the biosynthetic process continues for some time and then stops". Why does it stop after some time?

1.	The respiration stops in the absence of light and hence synthesis of sugars stops
2.	The reactions of the biosynthetic phase are directly dependent on light
3.	The reactions of the biosynthetic phase are dependent on the products of light reaction
4.	This is a mistake in NCERT as Dark Reactions will continue throughout night

18 In the given simplified diagram of the Calvin Cycle, ATP is utilized at points:


3 molecules CO_2
Stage 1: Carbon fixation
C
rubisco
A
Calvin cycle
Stage 3: Regeneration of starting molecule
$2P_i$
Stage 2: Reduction
5 molecules G3P
1 molecule G3P
B
1/2 molecule glucose ($C_6H_{12}O_6$)

1. A and B only
2. A and C only
3. B and C only
4. A, B and C

19 Identify the correct statements regarding RuBisCO:

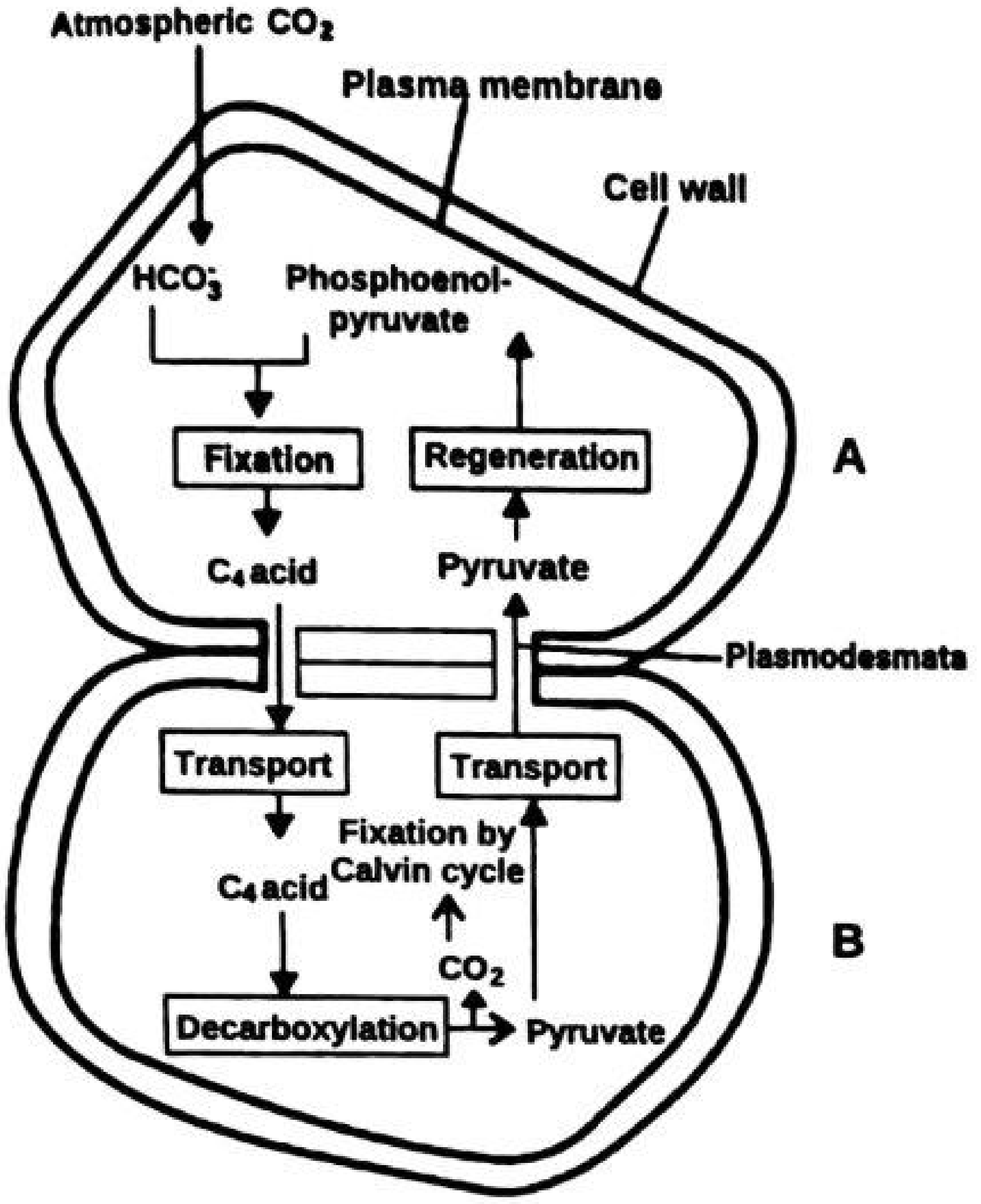
I:	It catalyzes the carboxylation of CO_2 to ribulose 1,5-bisphosphate.
II:	It initiates photorespiration when the CO_2/O_2 ratio is low.
III:	It catalyzes the reduction of two molecules of PGAL to form glucose.

1.	I and II only	2.	I and III only
3.	II and III only	4.	I, II and III

20 A C_3 and a C_4 plant were fed with carbon dioxide radioactively labeled with an isotope of carbon. In which of the following molecules, respectively in C_3 and C_4 plants, would radioactivity first appear as photosynthesis progresses?

1.	PGA and OAA	2.	Water and PGAL
3.	PGAL and Malic acid	4.	PEP and RuBP

21 The pathway shown in the figure will be seen in:


Atmospheric CO_2
Plasma membrane
Cell wall
HCO_3^-
Phosphoenol-pyruvate
Fixation
Regeneration
C_4 acid
Pyruvate
A
Plasmodesmata
Transport
Transport
Fixation by Calvin cycle
C_4 acid
CO_2
Decarboxylation
Pyruvate
B

1. C_4 plants
2. CAM plants
3. C_3 plants
4. All photosynthetic plants

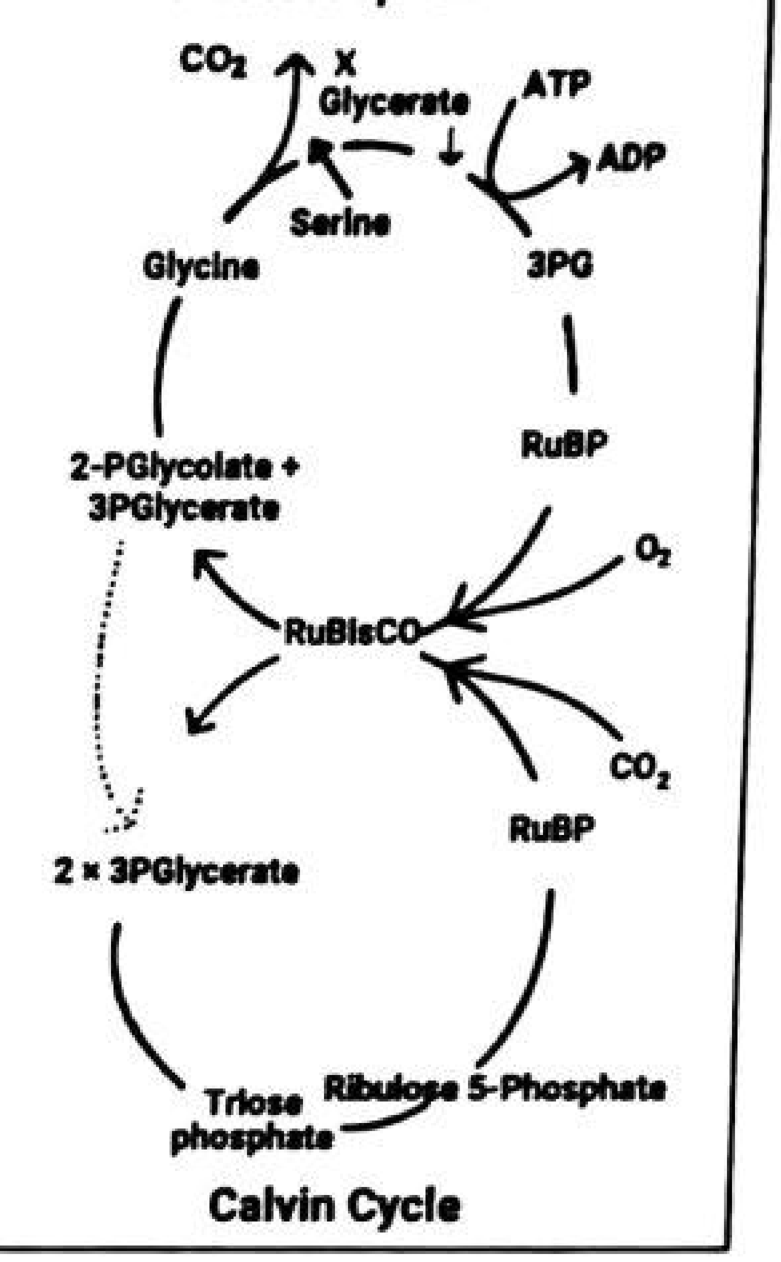
22 C_4 plants are special. Which of the following will be true for C_4 plants?

a.	They have a special type of leaf anatomy
b.	They tolerate higher temperature
c.	They show a response to high light intensities
d.	They lack a process called photorespiration
e.	They have greater productivity of biomass

1.	All except [e]
2.	[b], [c] and [d] only
3.	All
4.	[a], [b], [d] and [e] only

23 In the diagram showing relation between Calvin cycle and Photorespiration the molecule labeled X can be:

1. Oxygen
2. Ammonia
3. Nitric oxide
4. Hydrogen sulfide


Photorespiration
CO_2
X
Glycerate
ATP
ADP
Serine
Glycine
3PG
RuBP
2-PGlycolate + 3PGlycerate
O_2
RuBisCO
CO_2
RuBP
2 × 3PGlycerate
Triose phosphate
Ribulose 5-Phosphate
Calvin Cycle

24 The chronological order of organelles involved in the photorespiration cycle is:

1.	chloroplasts, leaf peroxisomes and mitochondria
2.	chloroplasts, mitochondria and leaf peroxisomes
3.	mitochondria, chloroplasts, and leaf peroxisomes
4.	mitochondria, leaf peroxisomes and chloroplasts

25 Blackman measured the effects of various factors – different light intensities, carbon dioxide concentrations and temperature on photosynthesis. He found that at high light intensities, an increase in temperature [up to 35^{0}C] or carbon dioxide accelerates photosynthesis. What can be concluded?

A:	Photosynthesis includes both light-dependent and light- independent reactions.
B:	Enzymes must carry out the light-independent reactions.

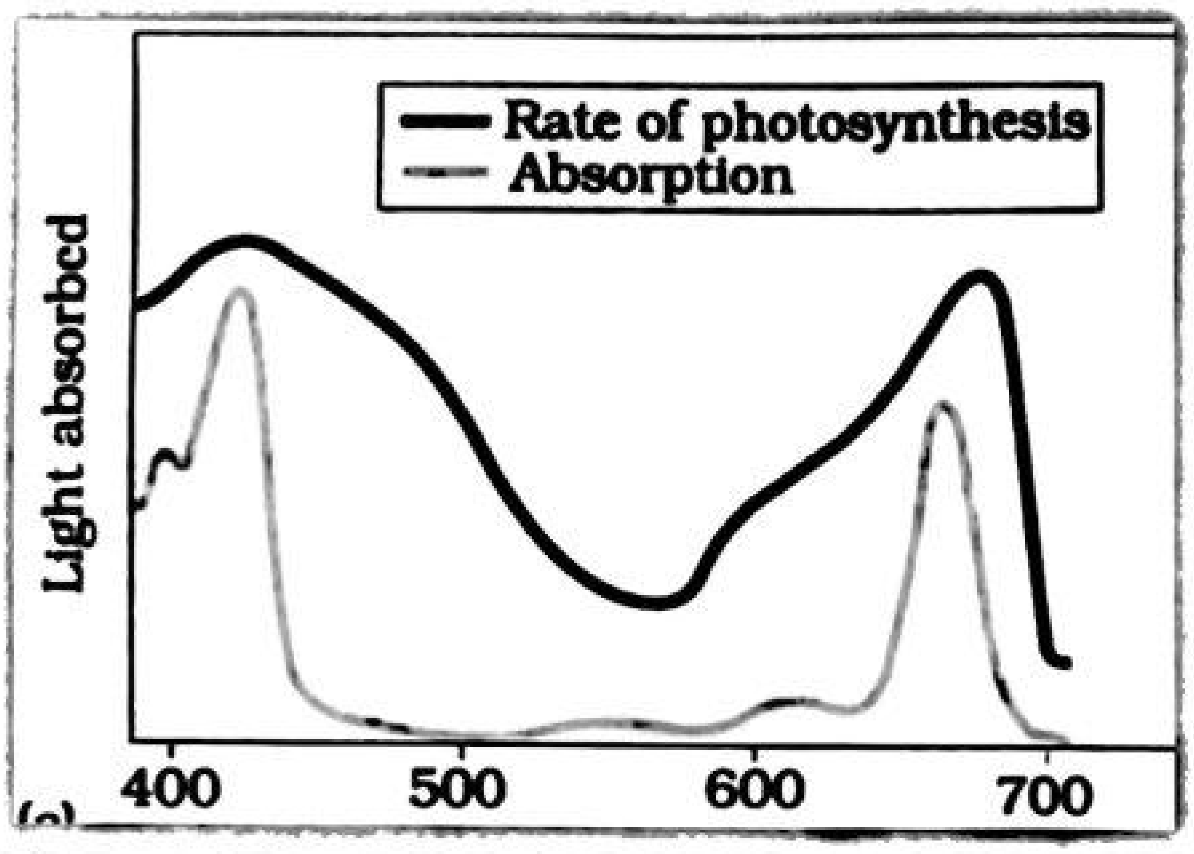
1.	Only **A**	2.	Only **B**
3.	Both **A** and **B**	4.	Neither **A** nor **B**

26 Consider the given two statements:

Statement I:	Except for plants in shade or in dense forests, light is rarely a limiting factor in nature.
Statement II:	There is a linear relationship between incident light and carbon dioxide fixation rates at low light intensities.

1.	Both **Statement I** and **Statement II** are correct and **Statement II** explains **Statement I**
2.	Both **Statement I** and **Statement II** are correct but **Statement II** does not explain **Statement I**
3.	**Statement I** is correct but **Statement II** is incorrect
4.	**Statement I** is incorrect but **Statement II** is correct

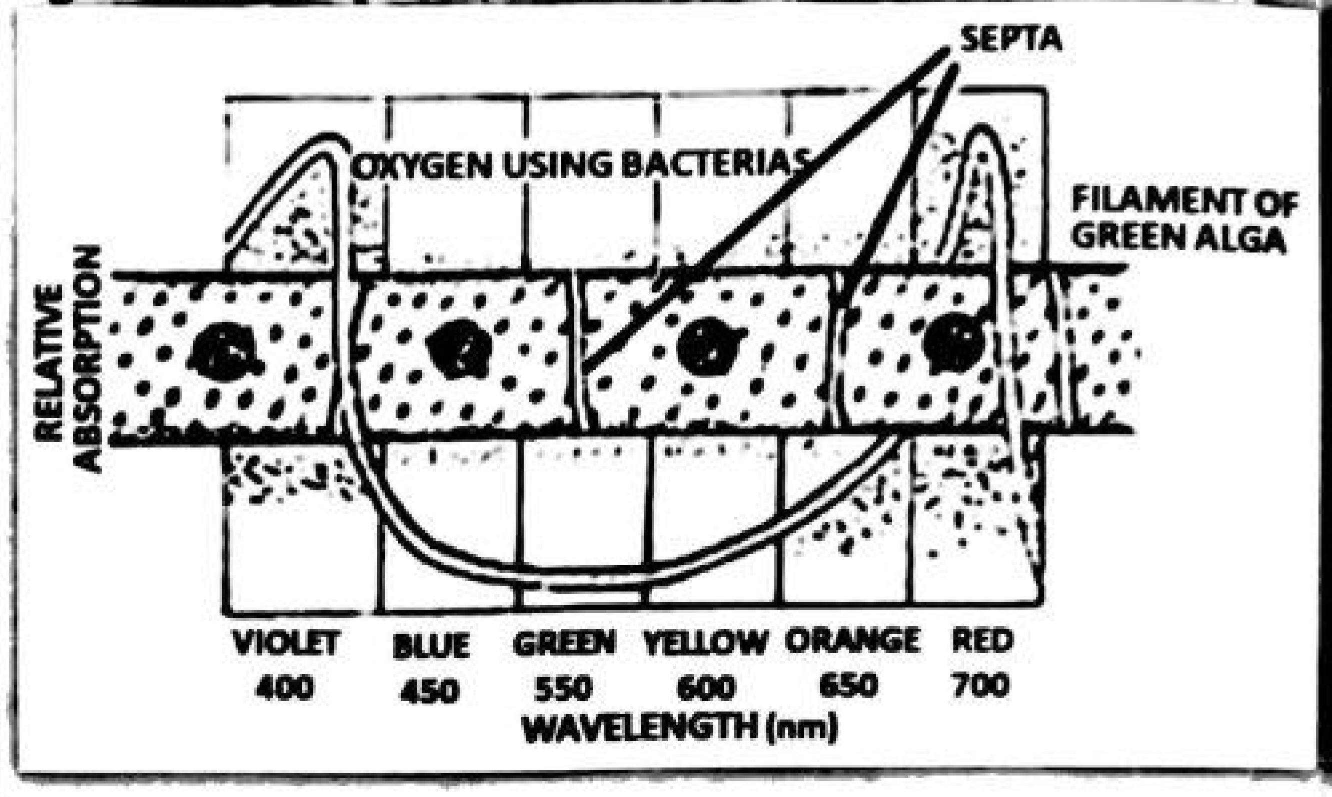
27 The given diagram shows action spectrum of photosynthesis superimposed on absorption spectrum of chlorophyll a. Identify the correct inference that can be drawn:



I:	Chlorophyll a is the chief pigment associated with photosynthesis.
II:	Most of the photosynthesis takes place in the blue and red regions of the spectrum.
III:	No pigments other than chlorophyll a are involved in absorbing sunlight in green plants.

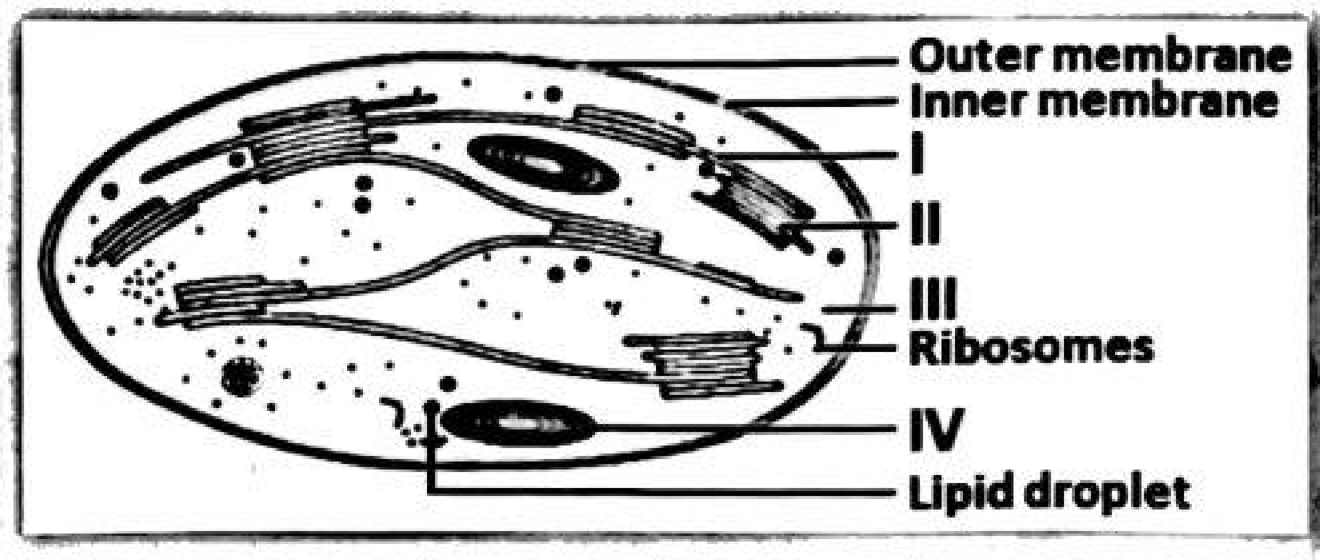
1. Only I and II
2. Only I and III
3. Only II and III
4. I, II and III

28 If you ran the Engelmann experiment without passing light through a prism, what would you predict?


SEPTA
OXYGEN USING BACTERIA
FILAMENT OF GREEN ALGA
RELATIVE ABSORPTION
VIOLET 400
BLUE 450
GREEN 550
YELLOW 600
ORANGE 650
RED 700
WAVELENGTH (nm)

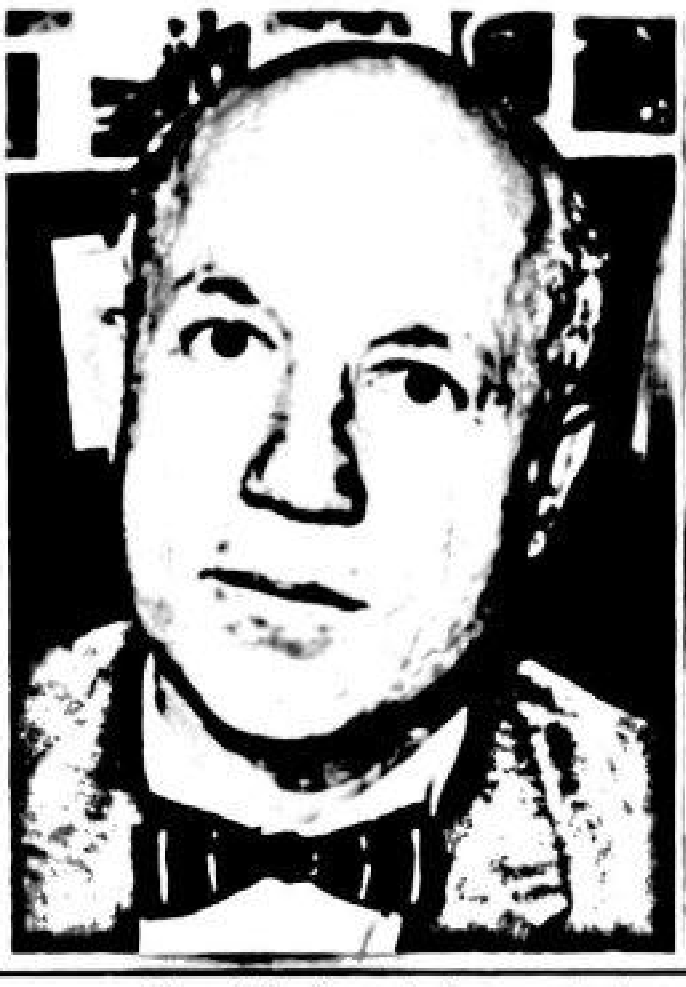
1. The results will be unaffected.
2. Even distribution along the length.
3. Accumulation only in red wavelength zone.
4. More cluster in the middle than at the ends.

29 Identify i, ii, iii and iv labellings in the following diagram :


Outer membrane
Inner membrane
I
II
III
Ribosomes
IV
Lipid droplet

	i	ii	iii	iv
1.	stroma lamella	thylakoid	stroma	genetic material
2.	stroma lamella	grana	stroma	starch granule
3.	grana	lamella	stroma	starch granule
4.	stroma lamella	grana	cytoplasm	starch granule

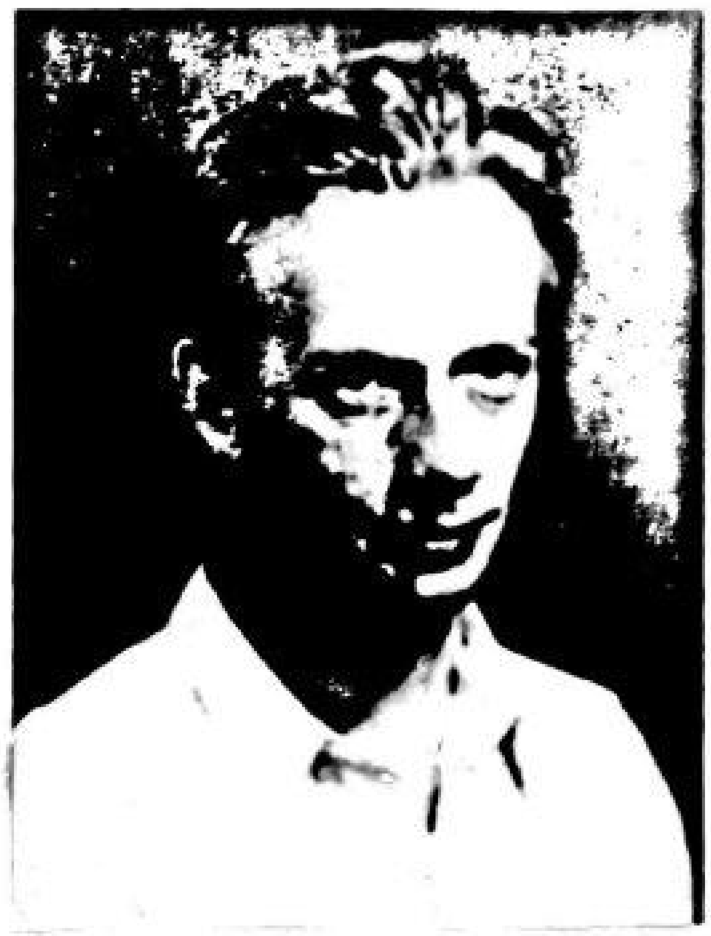
30 Identify the scientist:



I:	He used to say that his breakthrough in understanding the photosynthesis process came not in the lab but in a dark, quiet room where he would sit and think.
II:	He and his colleagues traced the path taken by carbon through different stages of photosynthesis.
III:	For this, they made use of tools such as radioactive isotopes and chromatography.
IV:	The light-independent reactions or the bio synthetic phase is named after him.

1.	Melvin Calvin	2.	F. F. Blackman
3.	Robin Hill	4.	T.W. Engelmann

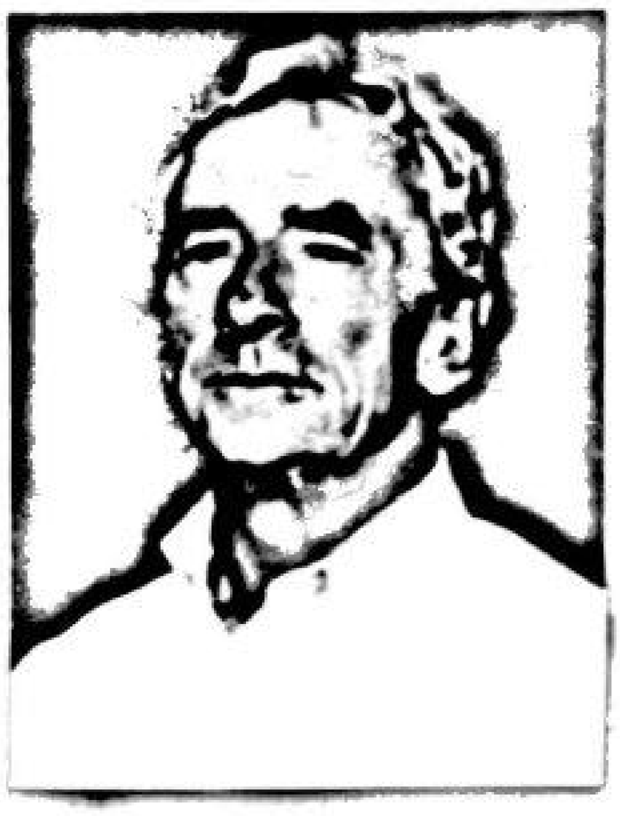
31 Identify the scientist:

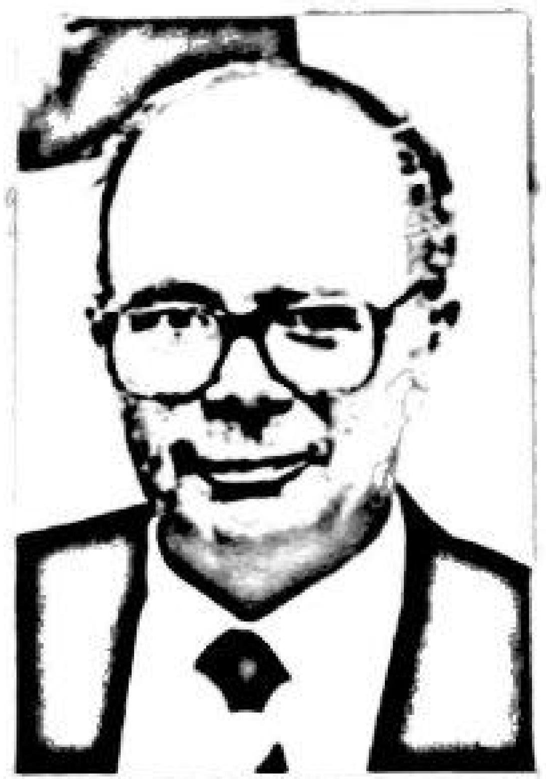


I:	He was known for being an incredibly passionate and engaging lecturer at Stanford University.
II:	He is renowned for his work on photosynthesis and for elucidating the fundamental principles of bacterial physiology.
III:	His revolutionary idea was that all photosynthetic organisms require a hydrogen donor.
IV:	He proposed that in green plants, water acts as this hydrogen donor, and oxygen is released as a byproduct.

1.	Arthur Kornberg	2.	C. B. van Niel
3.	Allan Campbell	4.	Daniel Israel Arnon

32 Identify the scientist duo:





I:	They worked in Australia and New Zealand.
II:	They jointly elucidated the C4 pathway for photosynthesis.

1.	Hershey and Chase	2.	Temin and Baltimore
3.	Beadle and Tatum	4.	Hatch and Slack

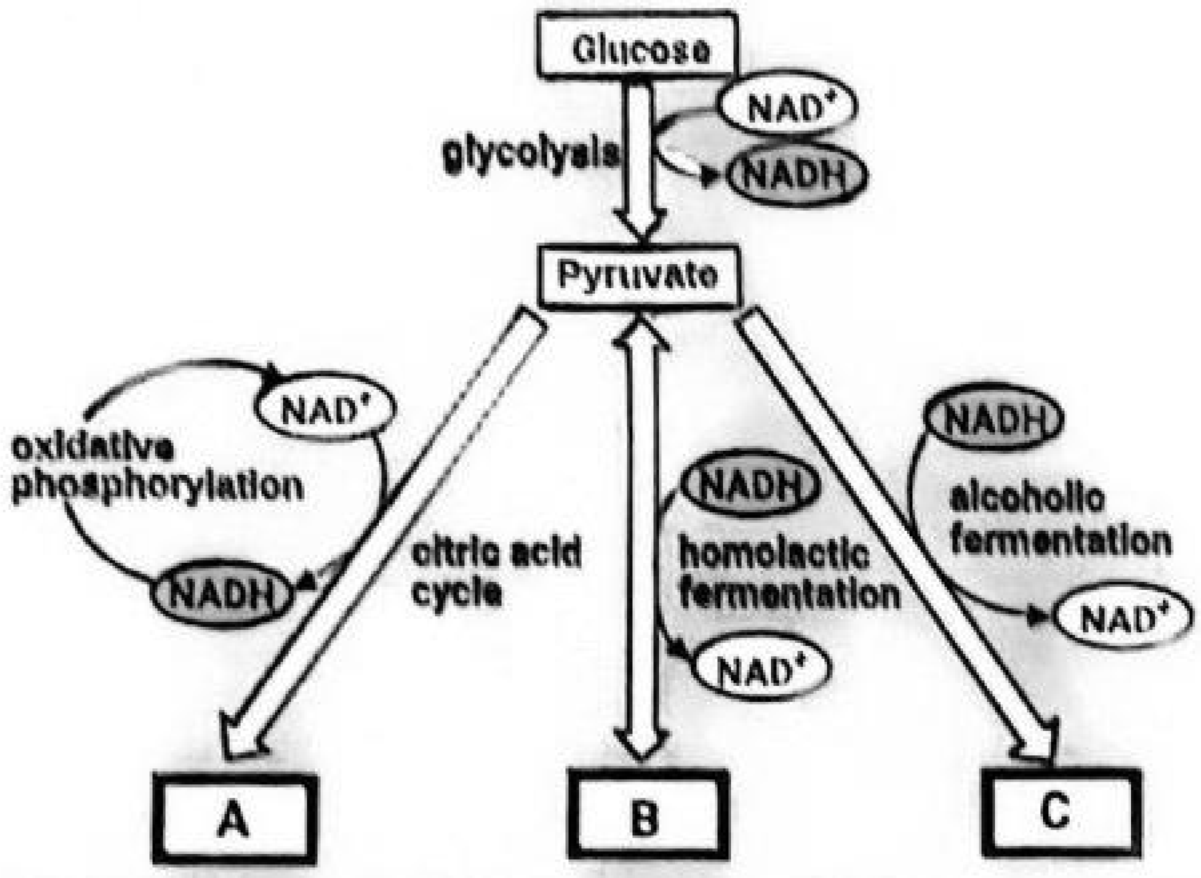
RESPIRATION IN PLANTS

33 Which of the following would be correct regarding the comparison of fermentation and aerobic respiration?

	Fermentation	Aerobic respiration
I:	Partial breakdown of glucose	Complete breakdown of glucose
II:	Net gain of only two molecules of ATP beginning with one molecule of glucose	Net gain of many more molecules of ATP beginning with one molecule of glucose
III:	NADH is oxidised to NAD^+ slowly	NADH is oxidised to NAD^+ vigorously

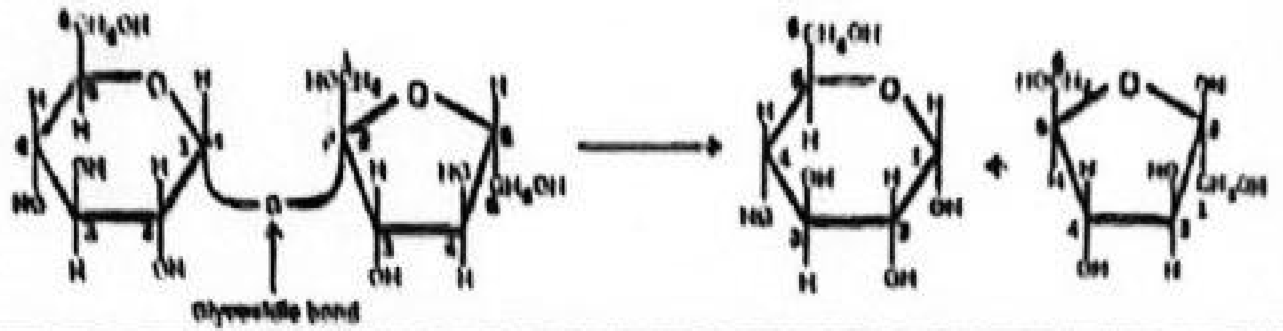
1.	Only I and II	2.	Only I and III
3.	Only II and III	4.	I, II and III

34 Pyruvate, the end product of glycolysis, has varied fates depending on the different conditions as shown below. The end products A, B and C are:


Glucose
NAD⁺
glycolysis
NADH
Pyruvate
NAD⁺
oxidative phosphorylation
NADH
citric acid cycle
NADH
homolactic fermentation
NAD⁺
NADH
alcoholic fermentation
NAD⁺
A
B
C

	A	B	C
1.	Carbon dioxide and Water	Lactate	Ethanol and Carbon dioxide
2.	Only Carbon dioxide	Lactate and Carbon dioxide	Ethanol and Carbon dioxide
3.	Carbon dioxide and Water	Lactate and Carbon dioxide	Ethanol
4.	Ethanol and Carbon dioxide	Lactate	Carbon dioxide and Water

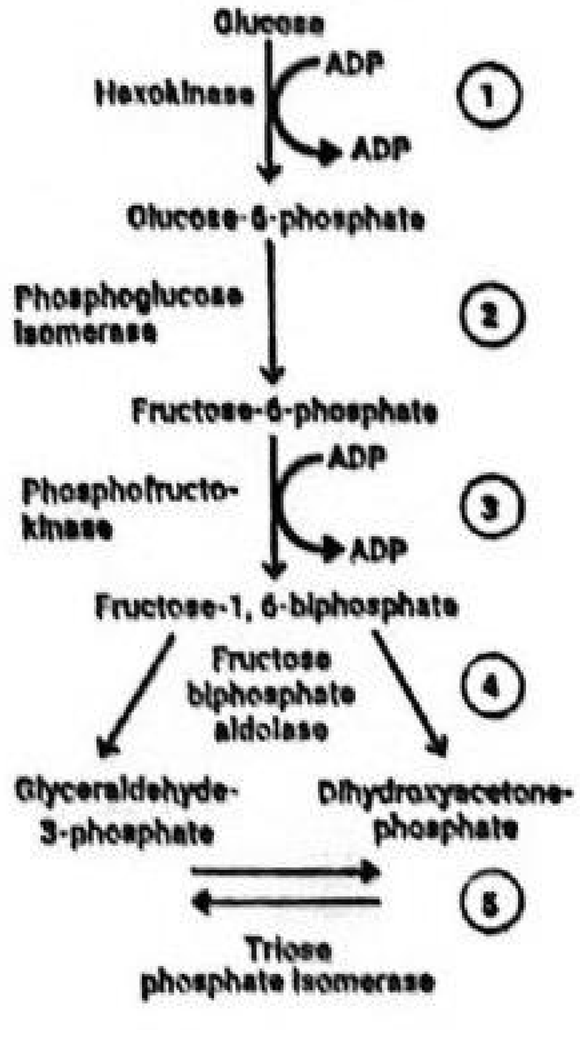
35 What will be true for the metabolic reaction shown in the given figure?


Glycosidic bond

I:	It shows hydrolysis of sucrose, a disaccharide, into two monosaccharides, a glucose and a fructose molecule.
II:	The enzyme that is capable of catalysing this reaction is invertase.

1.	Only I	2.	Only II
3.	Both I and II	4.	Neither I nor II

36 Consider the steps of glycolysis given in the diagram:

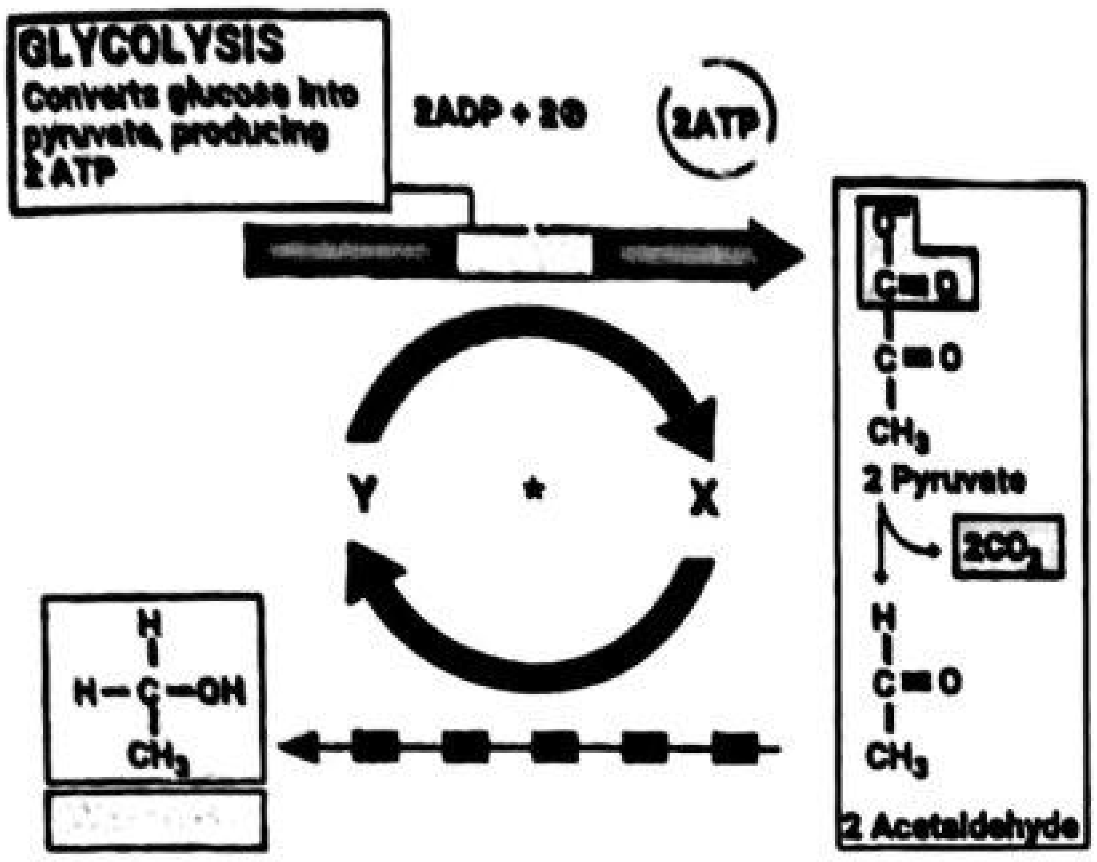

Glucose
Hexokinase
ADP
ADP
①
Glucose-6-phosphate
Phosphoglucose isomerase
②
Fructose-6-phosphate
Phosphofructo-kinase
ADP
ADP
③
Fructose-1, 6-biphosphate
Fructose biphosphate aldolase
④
Glyceraldehyde-3-phosphate
Dihydroxyacetone-phosphate
⑤
Triose phosphate isomerase

Regarding reaction 3 in the diagram:

I:	The reaction is a key regulatory point and is also the rate-limiting step.
II:	The reaction is freely reversible.

1. Only I is true
2. Only II is true
3. Both I and II are true
4. Both I and II are false

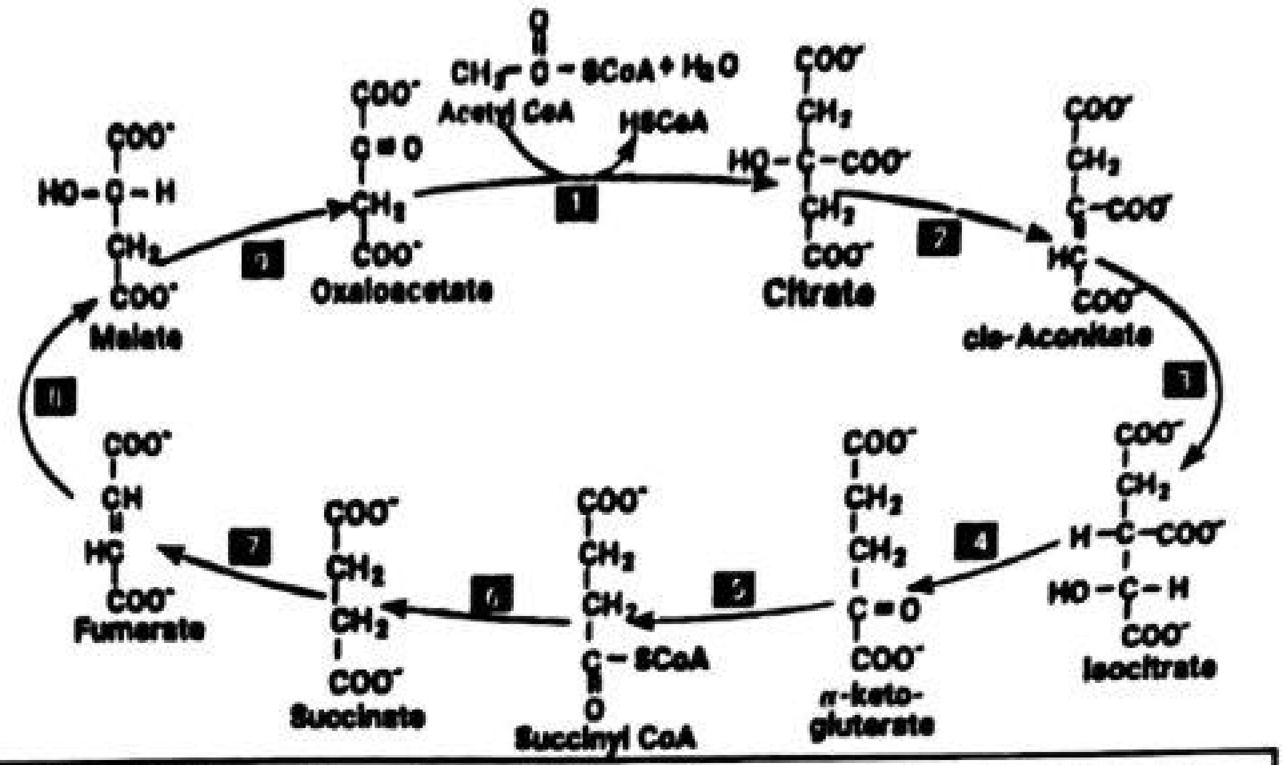
37 Given below is the schematic representation of alcohol fermentation. Study the diagram and select the correct statements that follow:


GLYCOLYSIS
Converts glucose into pyruvate, producing 2 ATP
2ADP + 2
2ATP
C=O
C=O
CH₃
2 Pyruvate
2CO₂
H
C=O
CH₃
2 Acetaldehyde
Y
X
H
H—C—OH
CH₃

I:	Yeasts perform this metabolic conversion when growing in the absence of oxygen.
II:	The metabolic conversion of pyruvate into acetaldeyhde is catalysed by the enzyme pyruvate dehydrogenase.
III:	The metabolic conversion of acetaldehyde into ethanol is catalysed by the enzyme alcohol dehydrogenase.

1.	I and II	2.	I and III
3.	II and III	4.	I, II and III

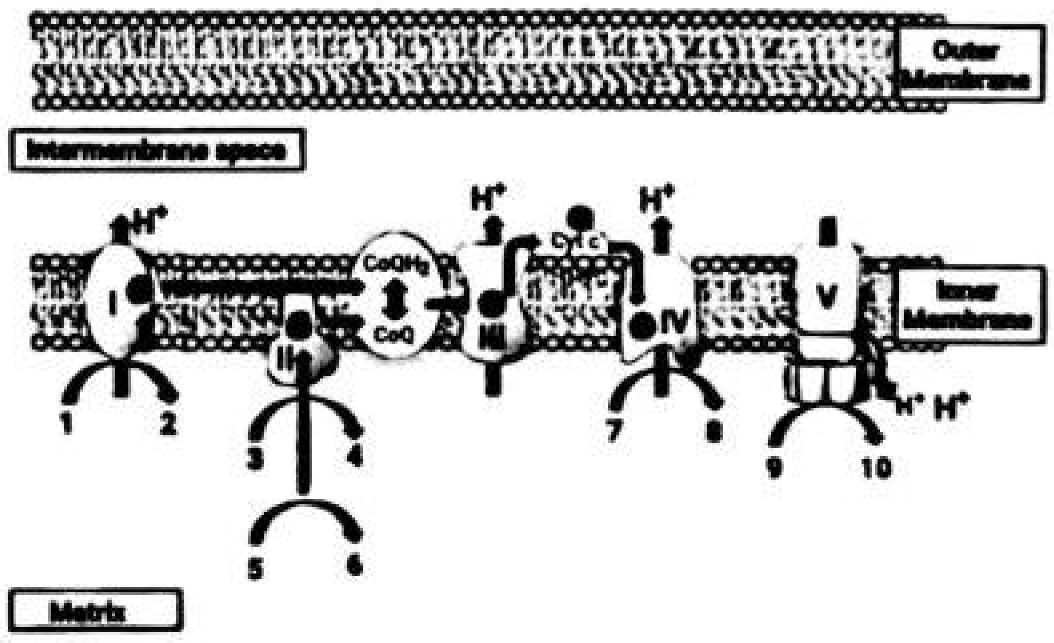
38 Given below is the schematic representation of the reactions in Krebs' Citric Acid Cycle. Identify the correct statements:


CH₃-C(=O)-SCoA + H₂O
Acetyl CoA
HSCoA
Oxaloacetate
Citrate
cis-Aconitate
Isocitrate
α-keto-glutarate
Succinyl CoA
Succinate
Fumarate
Malate
1
2
3
4
5
6
7
8
9

I:	Oxidative decarboxylation steps are Step 4 and Step 5.
II:	The reducing power 'NADH' is generated at Step 4, Step 5 and Step 9.
III:	$FADH_2$ is generated at Step 7.

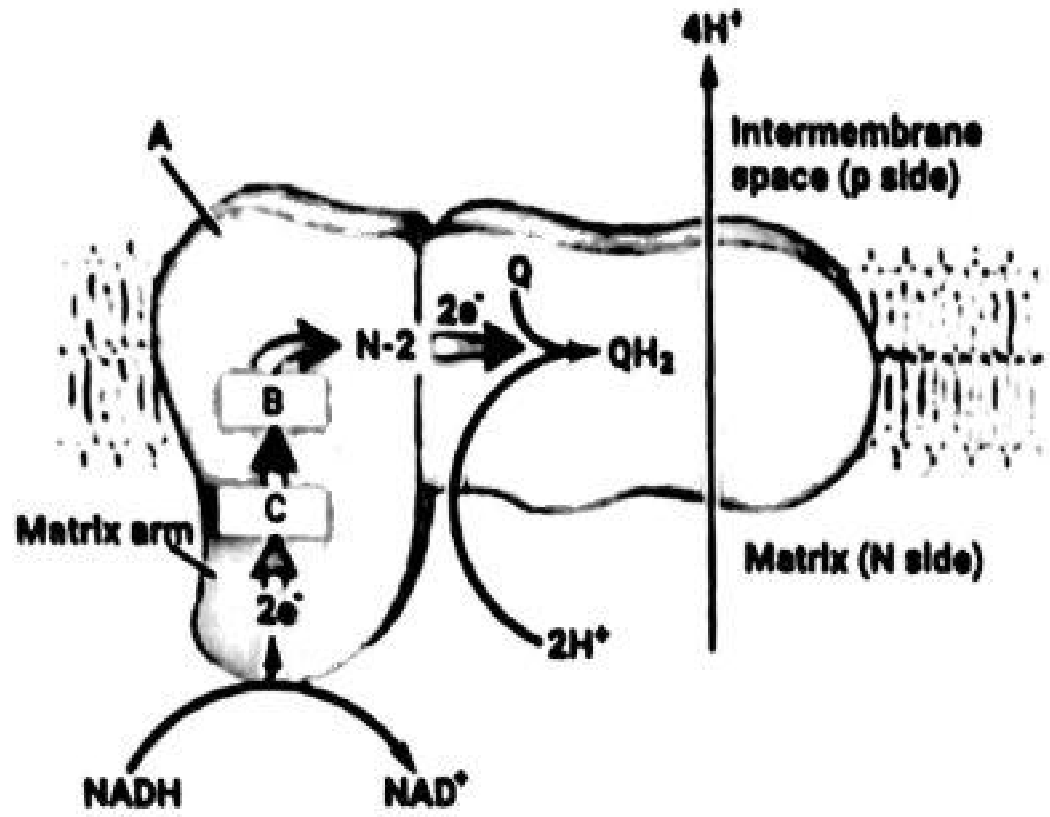
1.	Only I and II	2.	Only I and III
3.	Only II and III	4.	I, II and III

39 Given below is the schematic representation of the electron transport chain in mitochondria. Identify the correct statement:


Outer Membrane
Intermembrane space
H⁺
H⁺
H⁺
Cyt c
CoQH₂
CoQ
I
II
III
IV
V
Inner Membrane
H⁺ H⁺
1
2
3
4
5
6
7
8
9
10
Matrix

1.	(1) is NADH; 4 is FAD; 6 is fumarate; 8 is oxygen and 10 is ATP
2.	(2) is NAD^+ ; 4 is $FADH_2$; 6 is succinate; 8 is oxygen and 10 is ADP
3.	(1) is NADH; 4 is Fumarate; 6 is FAD; 8 is water and 10 is ATP
4.	(2) is NAD^+; 3 is succinate; 6 is FAD; 8 is oxygen and 10 is ADP

40 The given diagram shows an important component of the mitochondrial electron transport chain. Identify A, B and C:



	A	B	C
1.	Complex I	FMN	Fe-S
2.	Complex I	Fe-S	FMN
3.	Complex II	FMN	Fe-S
4.	Complex II	Fe-S	FMN

41 Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R):

Assertion (A):	ATP: NADH + H^+ and ATP: FADH2 ratios during the oxidative phosphorylation appear to be not 3 and 2, but 2.5 and 1.5 respectively.
Reason (R):	ATP synthase produces 1 ATP/$3H^+$.

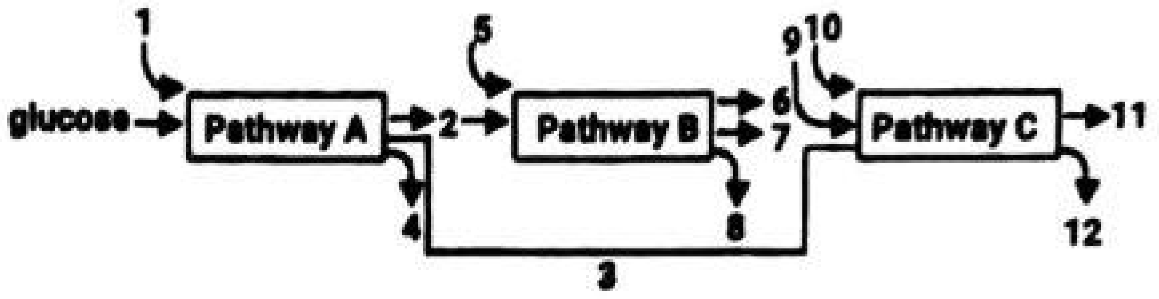
In the light of the above statements choose the correct answer from the options given below:

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	Both **(A)** and **(R)** are False.

42 All enzymes of TCA cycle are located in the mitochondrial matrix except one which is located in inner mitochondrial membranes in eukaryotes and in cytosol in prokaryotes. This enzyme is

1. lactate dehydrogenase
2. isocitrate dehydrogenase
3. malate dehydrogenase
4. succinate dehydrogenase

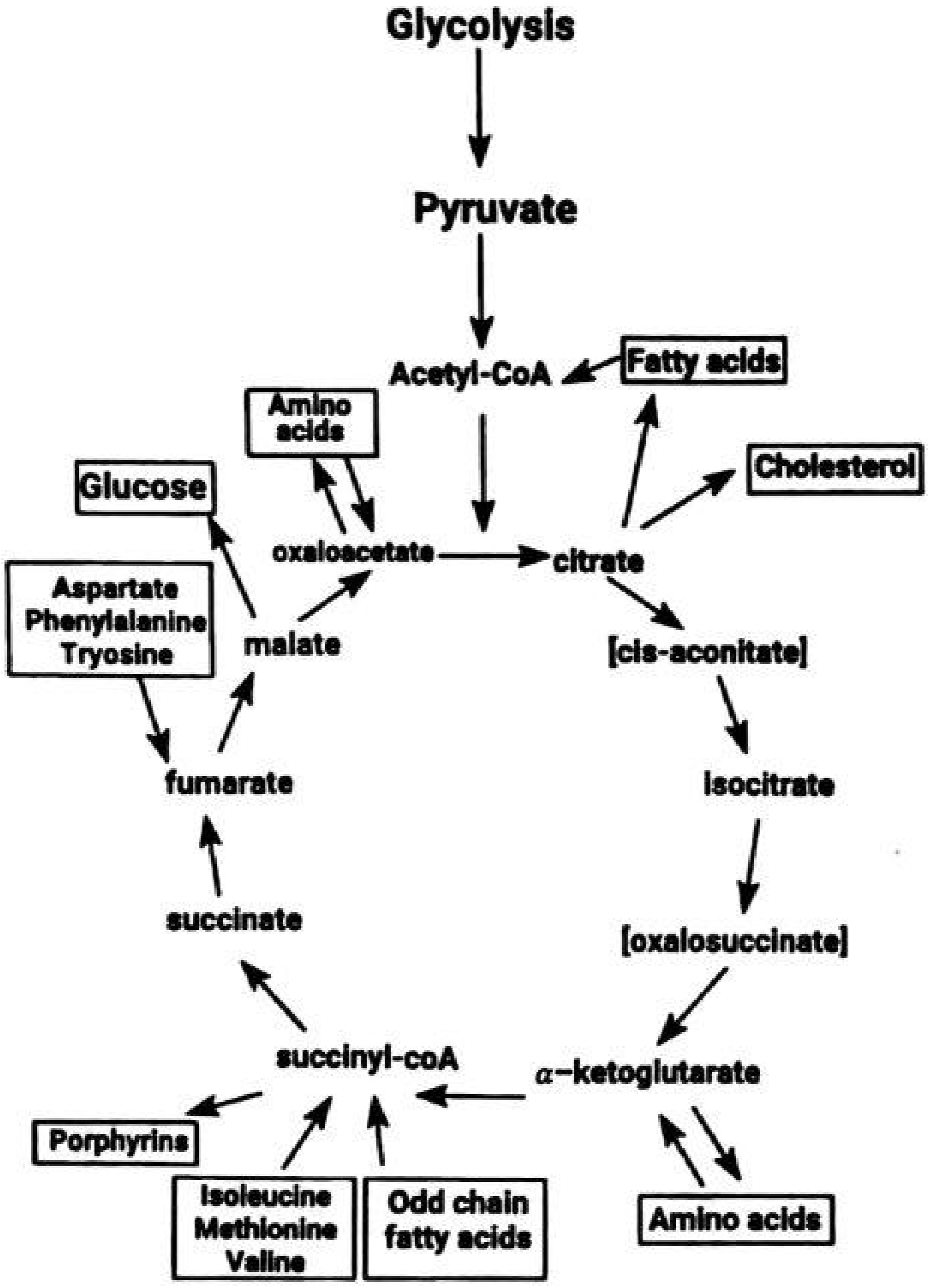
43 The three boxes in this diagram represent the three major biosynthetic pathways in aerobic respiration. Arrows represent net reactants or products.



Arrows numbered 4, 8, 12 can all be

1.	NADH	2.	ATP
3.	H_2O	4.	FAD^+ or $FADH_2$

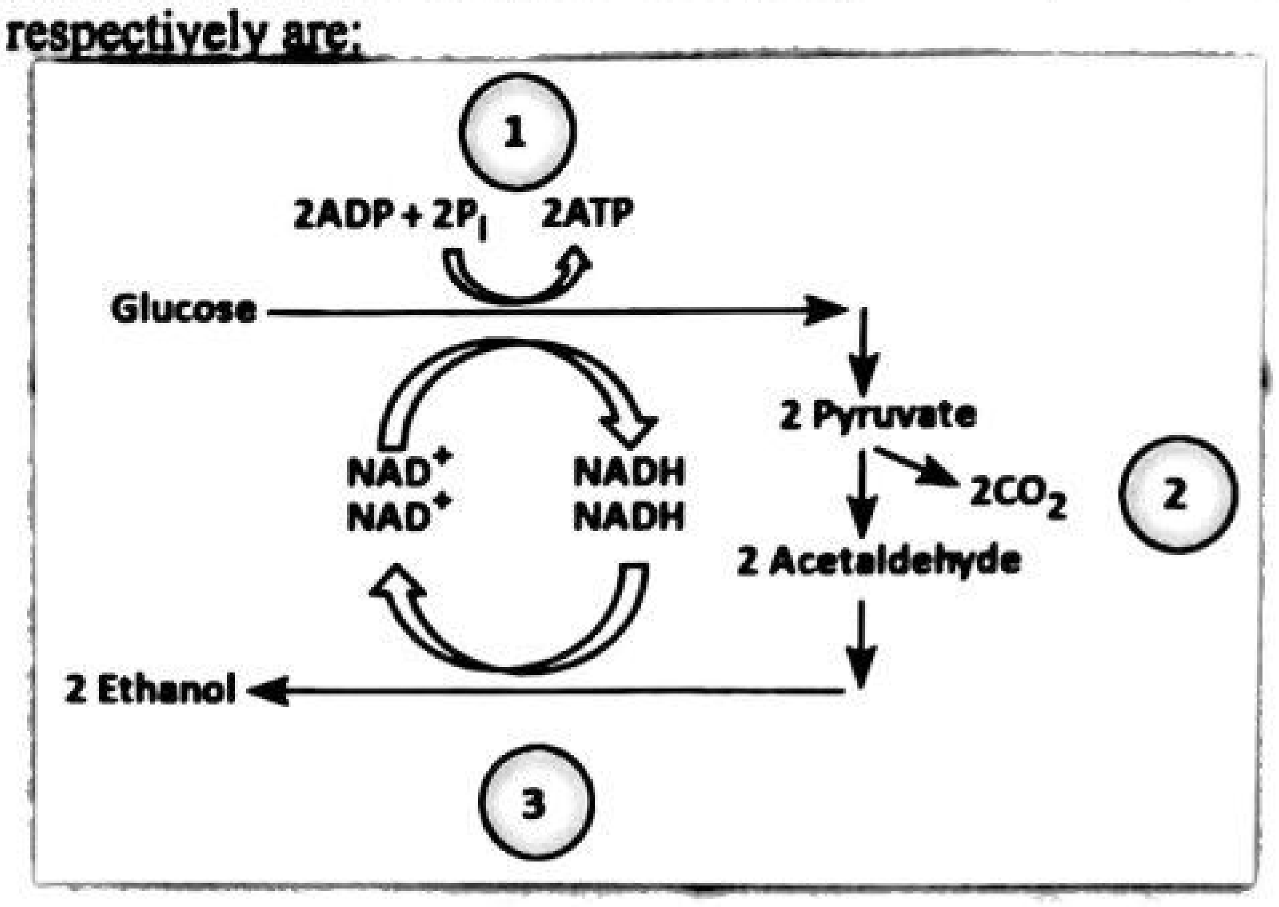
44 Study the metabolic pathway given below and select the correct statements from the statements given:


Glycolysis
Pyruvate
Acetyl-CoA
Fatty acids
Amino acids
Glucose
Cholesterol
oxaloacetate
citrate
Aspartate
Phenylalanine
Tryosine
malate
[cis-aconitate]
fumarate
isocitrate
succinate
[oxalosuccinate]
succinyl-coA
α-ketoglutarate
Porphyrins
Isoleucine
Methionine
Valine
Odd chain fatty acids
Amino acids

I:	It shows that the Krebs cycle is an amphibolic pathway.
II:	An amphibolic pathway is a type of catabolic pathway that is involved in the production of ATP.

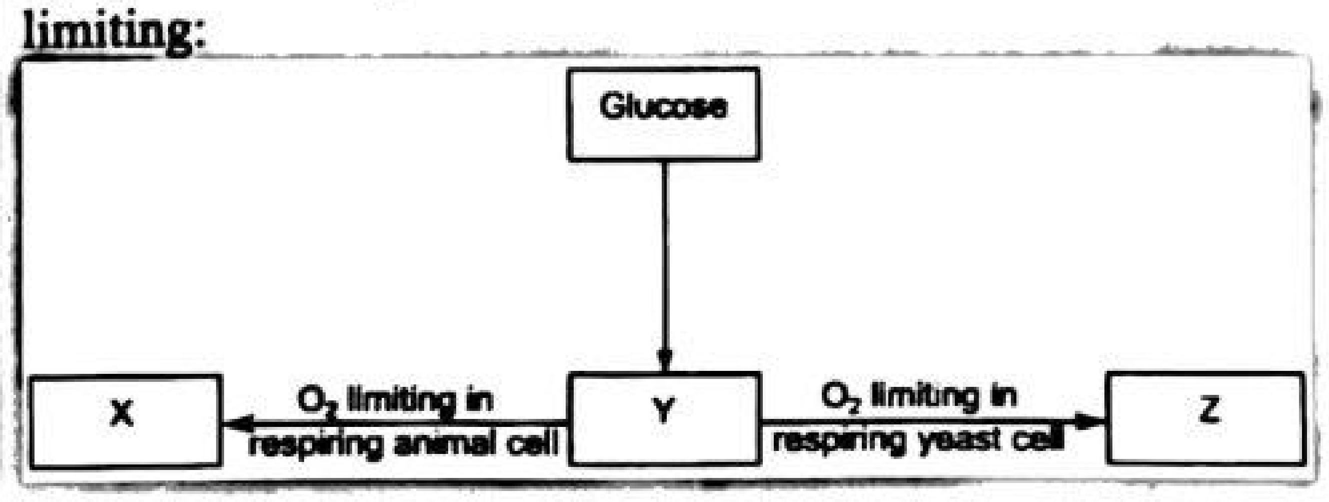
1. Only I is correct
2. Only II is correct
3. Both I and II are correct
4. Both I and II are incorrect

45 In the given schematic representation of ethanol fermentation, the enzymes catalysing the step 2 and 3 respectively are:


1
2ADP + 2P$_i$
2ATP
Glucose
2 Pyruvate
NAD$^+$
NAD$^+$
NADH
NADH
2CO$_2$
2
2 Acetaldehyde
2 Ethanol
3

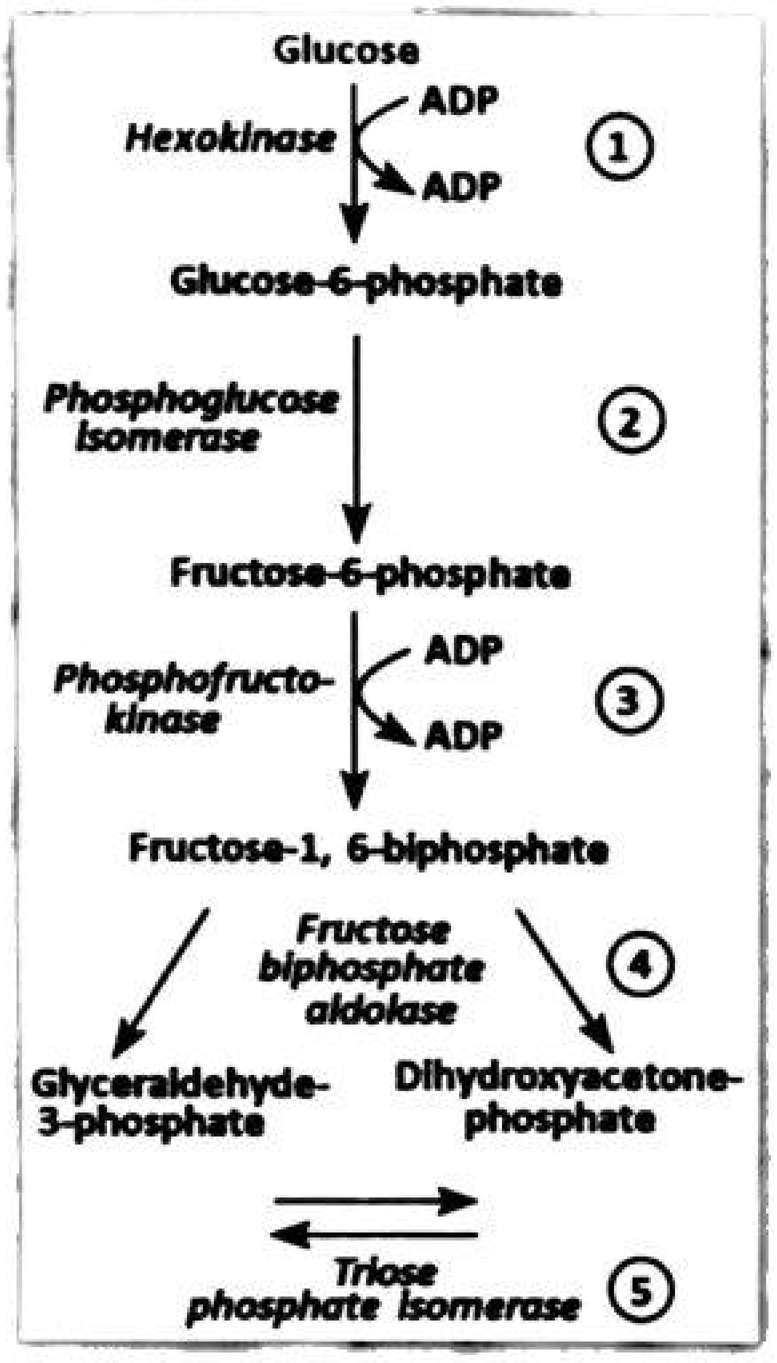
1. Pyruvate dehydrogenase and alcohol dehydrogenase
2. Pyruvic acid decarboxylase and alcohol dehydrogenase
3. Pyruvate dehydrogenase and alcohol decarboxylase
4. Pyruvic acid decarboxylase and alcohol decarboxylase

46 The diagram shows the respiration process in the cytoplasm of a yeast cell or an animal cell when O_2 is limiting:


Glucose
X
O_2 limiting in respiring animal cell
Y
O_2 limiting in respiring yeast cell
Z

Which option correctly identifies substances X, Y, and Z?
1. X = pyruvate; Y = lactate; Z = ethanol
2. X = lactate; Y = ethanol; Z = pyruvate
3. X = ethanol; Y = pyruvate; Z = lactate
4. X = lactate; Y = pyruvate; Z = ethanol

47 Consider the steps of glycolysis given in the diagram:

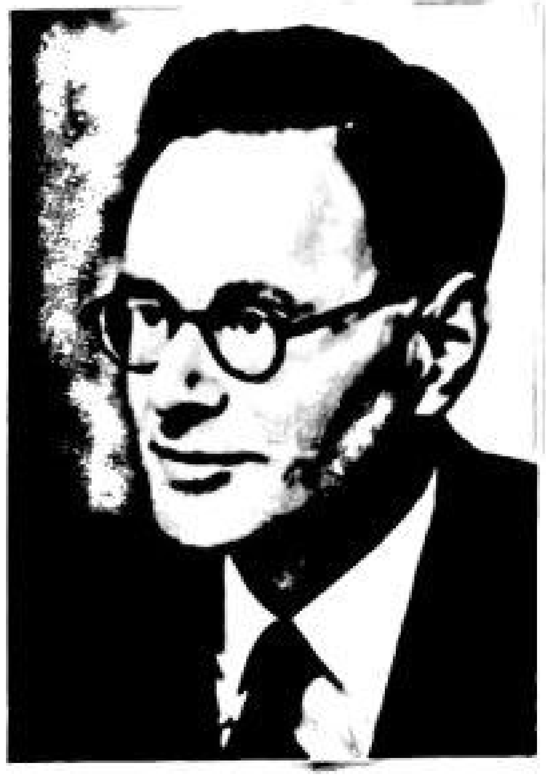

Glucose
Hexokinase
ADP
ADP
①
Glucose-6-phosphate
Phosphoglucose isomerase
②
Fructose-6-phosphate
Phosphofructo-kinase
ADP
ADP
③
Fructose-1, 6-biphosphate
Fructose biphosphate aldolase
④
Glyceraldehyde-3-phosphate
Dihydroxyacetone-phosphate
Triose phosphate isomerase
⑤

Regarding reaction 2 in the diagram:

I:	Fructose can also enter the glycolytic pathway by phosphorylation at this point.
II:	Under conditions of high F6P concentration, this reaction readily runs in reverse.

1. Only **I** is true
2. Only **II** is true
3. Both **I** and **II** are true
4. Both **I** and **II** are false

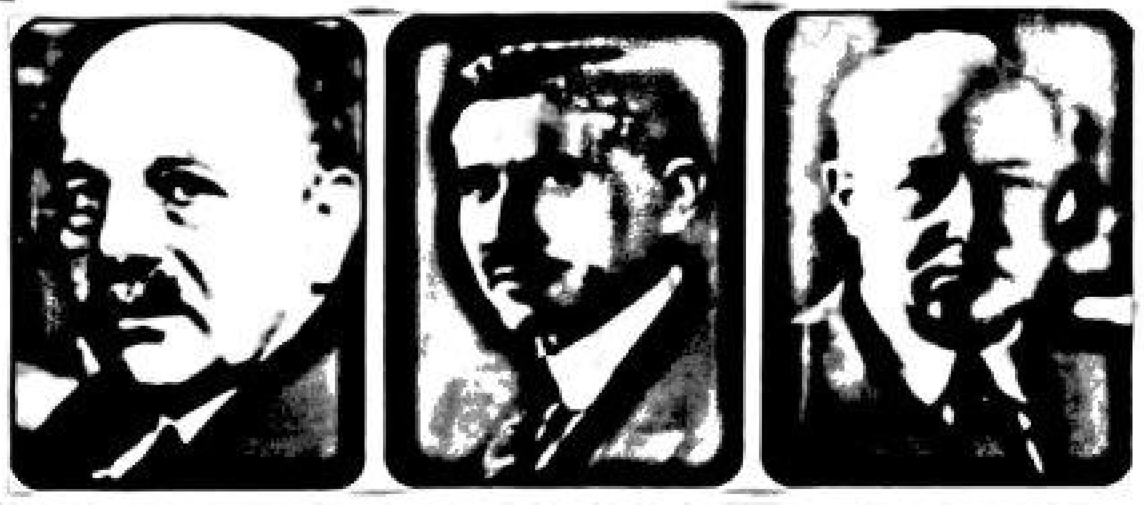
48 Identify the scientist:



I:	Unable to publish his findings in a leading journal because the editor rejected his paper, stating that the work was "too complicated", he published his paper in a less prestigious journal.
II:	He presented a complete picture of an important part of metabolism—the citric acid cycle.

1.	Fritz Lipmann	2.	Albert Szent-Györgyi
3.	Hans Krebs	4.	Jan Ingenhousz

49 Identify the trio:

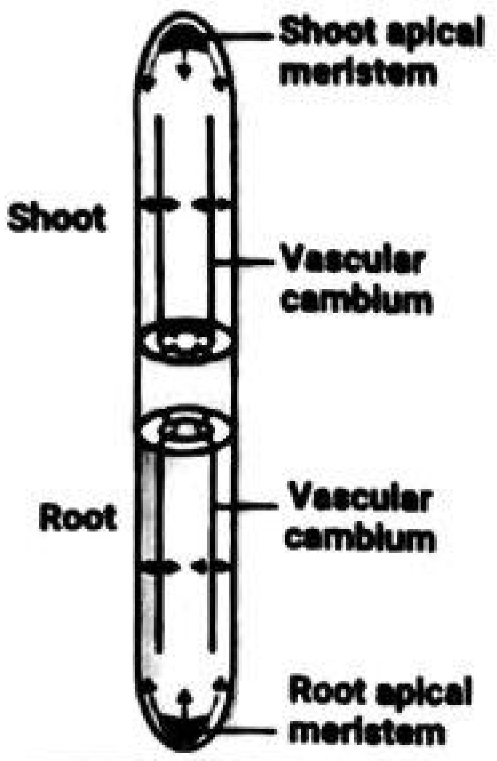


I:	A famous story recounts how during a conference, they drew out the entire glycolytic pathway on a napkin during a lunch break.
II:	One of them, although never awarded a Nobel prize, was nominated 12 times over 8 years and one of them died in a prison.

1. Watson, Crick and Wilkins
2. Nirenberg, Khorana and Matthaei
3. Avery, Macleod and McCarty
4. Embden, Meyerhof, Parnas

PLANT GROWTH AND DEVELOPMENT

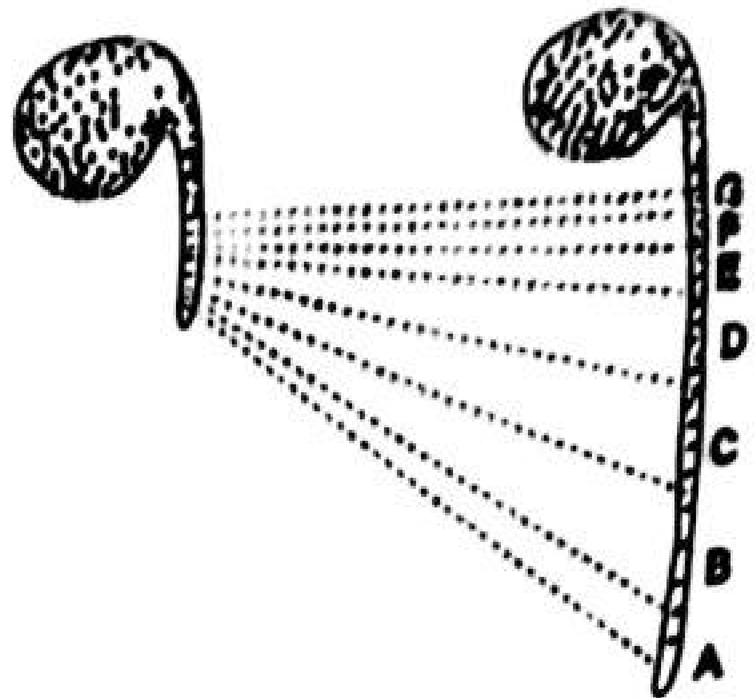
50 Select the correct statements based on the information shown below in the diagrammatic representation of location of root apical meristem, shoot apical meristem and vascular cambium where the arrows exhibit the direction of growth of cells and organs:



Statement I:	The root apical meristem and the shoot apical meristem are responsible for the primary growth of the plants and principally contribute to the elongation of the plants along their axis.
Statement II:	In dicots and gymnosperms, the lateral meristems, vascular cambium and cork-cambium appear later in life and cause the increase in the girth of the organs in which they are active.

1. Both **Statement I** and **Statement II**
2. Only **Statement I**
3. Only **Statement II**
4. Neither **Statement I** nor **Statement II**

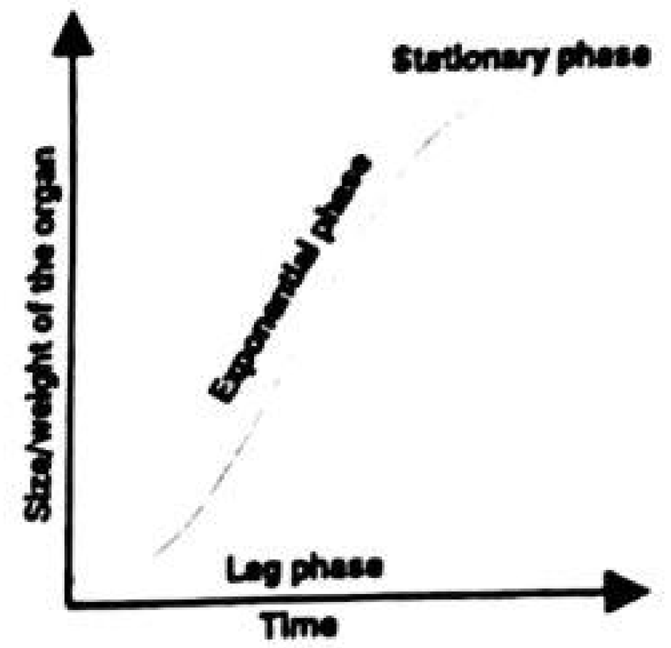
51 Based on the given diagram of root tip, which of the following statements will be true?



I:	The region shown as A to G is the zone of elongation.
II:	The portion of the axis which is undergoing the phase of maturation lies more distal to the phase of elongation.

1. Only **I**	2. Only **II**
3. Both **I** and **II**	4. Neither **I** nor **II**

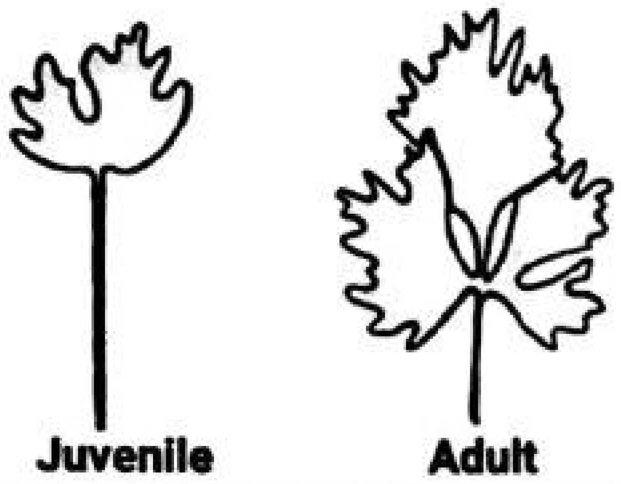
52 The given curve:



I:	is characteristic of living organism growing in a natural environment.
II:	is typical for all cells, tissues and organs of a plant.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

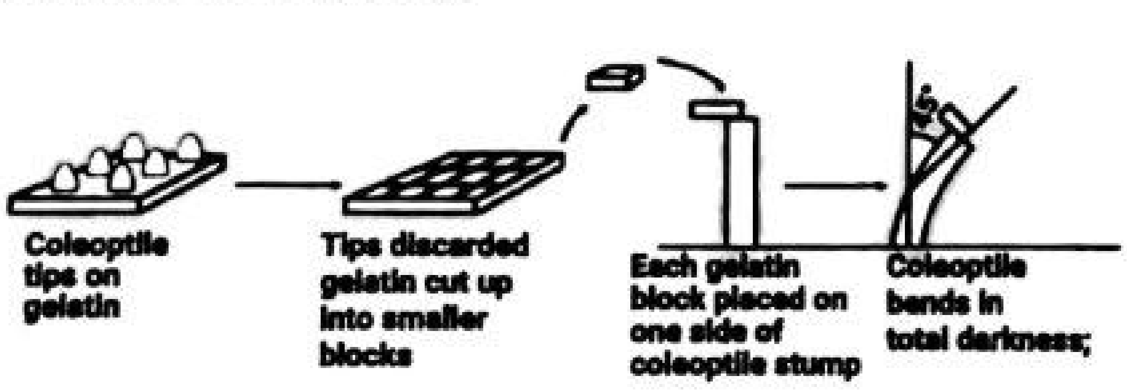
53 The diagram given shows hetrophylly in Larkspur. What will be true regarding this phenomenon?


Juvenile
Adult

I:	It is more important for plants than most animals.
II:	Plants have open growth and development.

1. Both I and II are true and II explains I.
2. Both I and II are true but II does not explain I.
3. I is correct and II is incorrect.
4. I is incorrect and II is correct.

54 The diagram shows the schematic representation of an experiment that made bioassay of auxins possible. This experiment was done by:


Coleoptile tips on gelatin
Tips discarded gelatin cut up into smaller blocks
Each gelatin block placed on one side of coleoptile stump
Coleoptile bends in total darkness;

1.	Darwin	2.	Boysen Jenson
3.	Paal	4.	Went

55 By continually removing apical buds, horticulturists can remodel a tree or a shrub into remarkable shapes as shown in the given figure. The reason is:

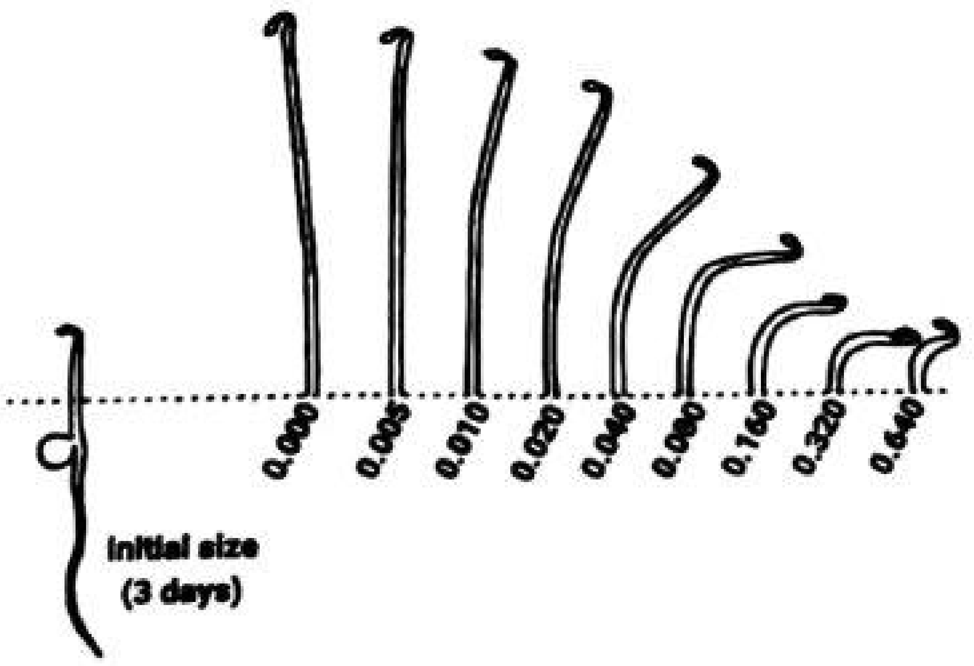
1.	When the apical bud is removed, the lowered IAA concentration allows the lateral buds to grow and produce new shoots, which compete to become the lead growth.
2.	When the apical bud is removed, the increased IAA concentration allows the lateral buds to grow and produce new shoots, which compete to become the lead growth.
3.	When the apical bud is removed, the lowered IAA concentration stops the growth of lateral buds and production of new shoots.
4.	When the apical bud is removed, the increased IAA concentration stops the growth of lateral buds and production of new shoots.

56 Identify the correct statements regarding auxins?

I:	Auxin stimulates cell elongation by stimulating wall-loosening factors, such as expansins, to loosen cell walls.
II:	When auxin and cytokinin are applied to callus, rooting can be generated with higher auxin to cytokinin ratios, shoot growth is induced by lower auxin to cytokinin ratios.
III:	Auxin induces the formation and organization of phloem and xylem.
IV:	In low concentrations, auxin can inhibit ethylene formation and transport of precursor in plants; however, high concentrations can induce the synthesis of ethylene.

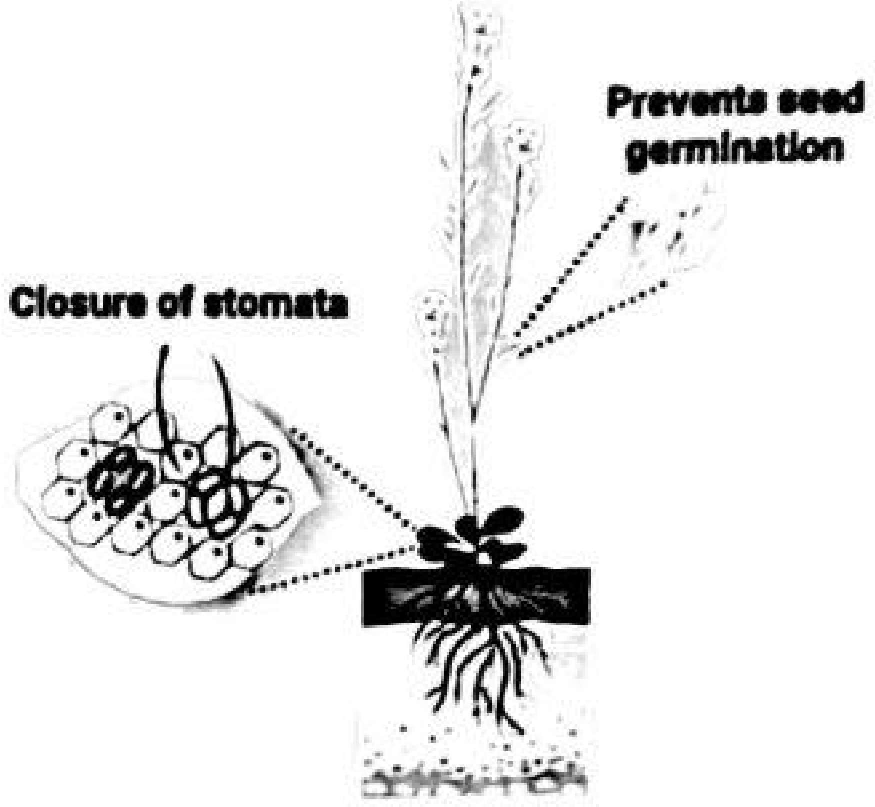
1. Only I, II and III
2. Only I, III and IV
3. Only II, III and IV
4. I, II, III and IV

57 The given figure shows the effects of increasing concentration of a certain PGR on the growth of seven-day-old dark-grown pea seedlings. The effects include a decrease in epicotyl elongation, a thickening of the shoot and a change in orientation of growth from vertical to horizontal. Which PGR would be responsible for these effects?



1.	Auxins	2.	Cytokinins
3.	Gibberellins	4.	Ethylene

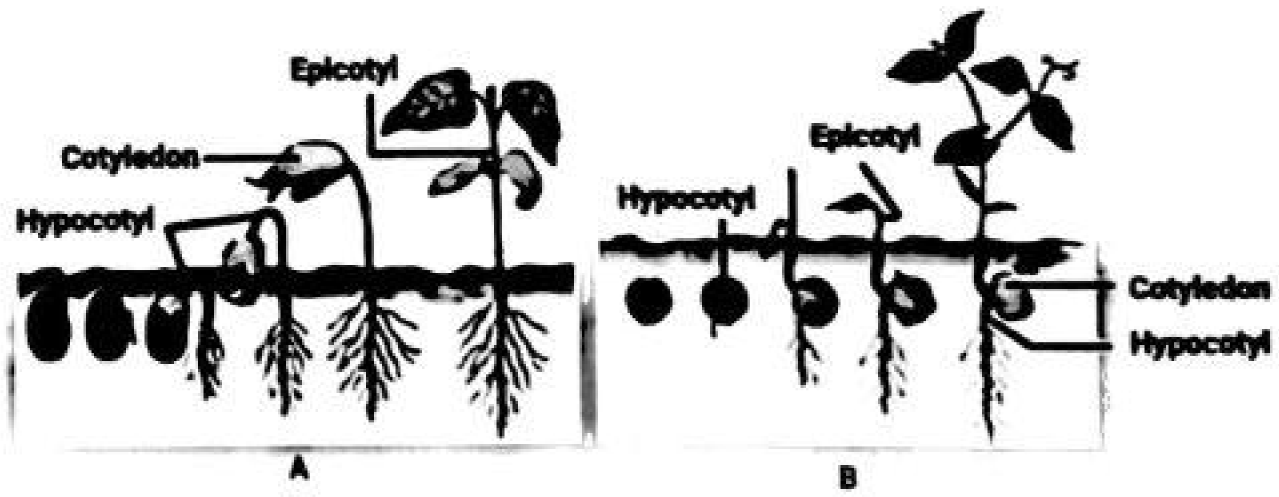
58 What will be true for plant growth regulator involved in the responses in plants as shown in the given figure?



I:	The PGR is ABA.
II:	Chemically, it is a terpene.
III:	Seed germination is inhibited by it in antagonism with gibberellin.
IV:	It is also produced in the roots in response to decreased soil water potential.

1.	Only I, II and III	2.	Only I, II and IV
3.	Only I, III and IV	4.	Only II, III and IV

59 Consider the given diagram regarding seed germination and identify the correct statements from the statements given:

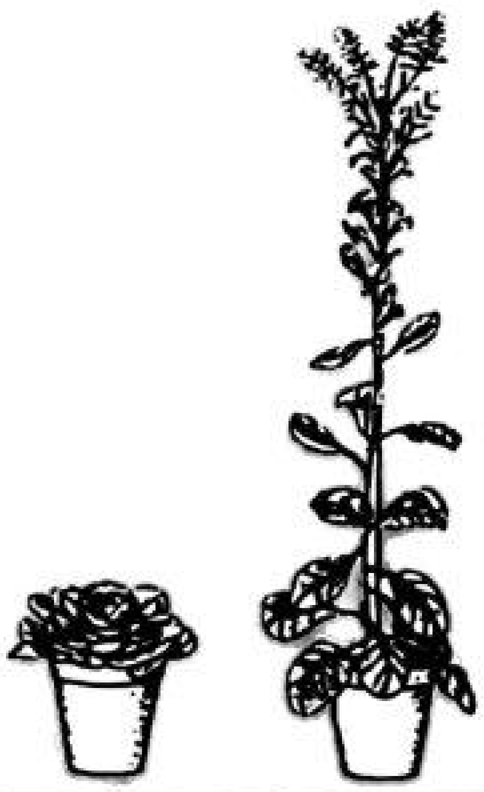


I:	'A' shows epigeal germination and 'B' shows hypogeal germination.
II:	In hypogeal germination, seeds are much less vulnerable to grazing.
III:	Plants showing hypogeal germination are more commonly found in nutrient-poor soils.
IV:	Plants showing epigeal germination produce a large number of seeds.

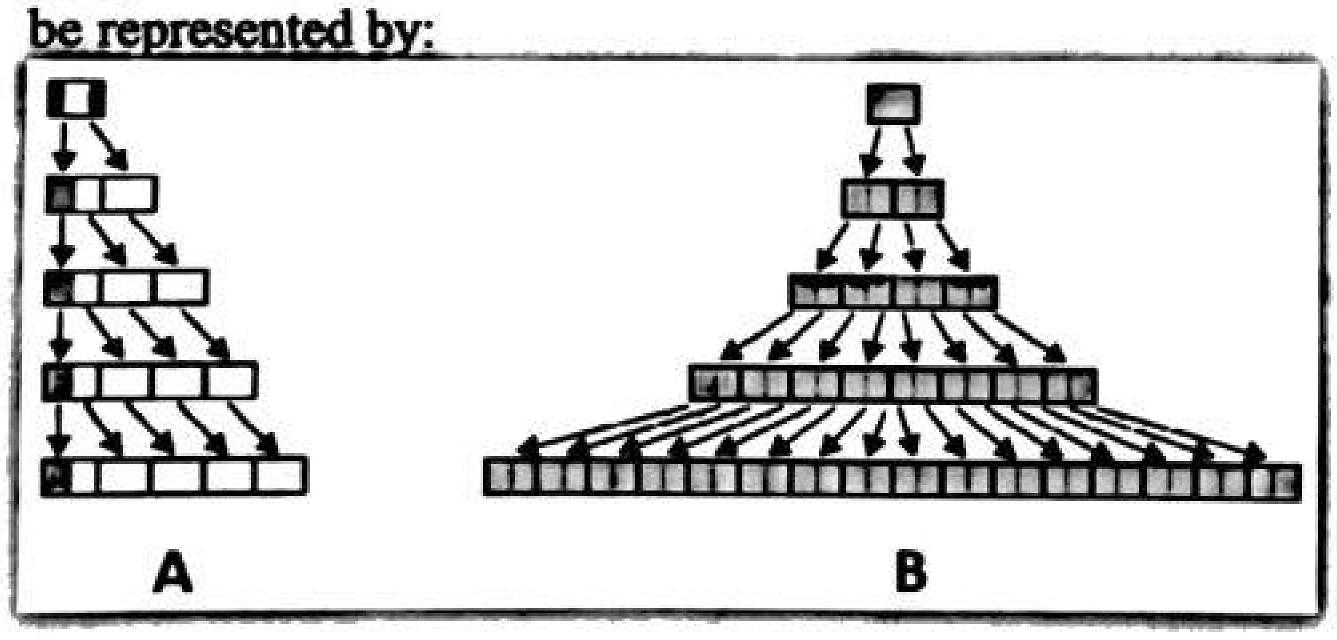
1. Only **I, II** and **III** are correct
2. Only **I, II** and **IV** are correct
3. Only **II, III** and **IV** are correct
4. **I, II, III** and **IV** are correct

60 Which plant growth regulator will most likely be responsible for the peculiar effect on plant as shown in the given figure?

1. Auxins
2. Cytokinins
3. Gibberellins
4. Ethylene



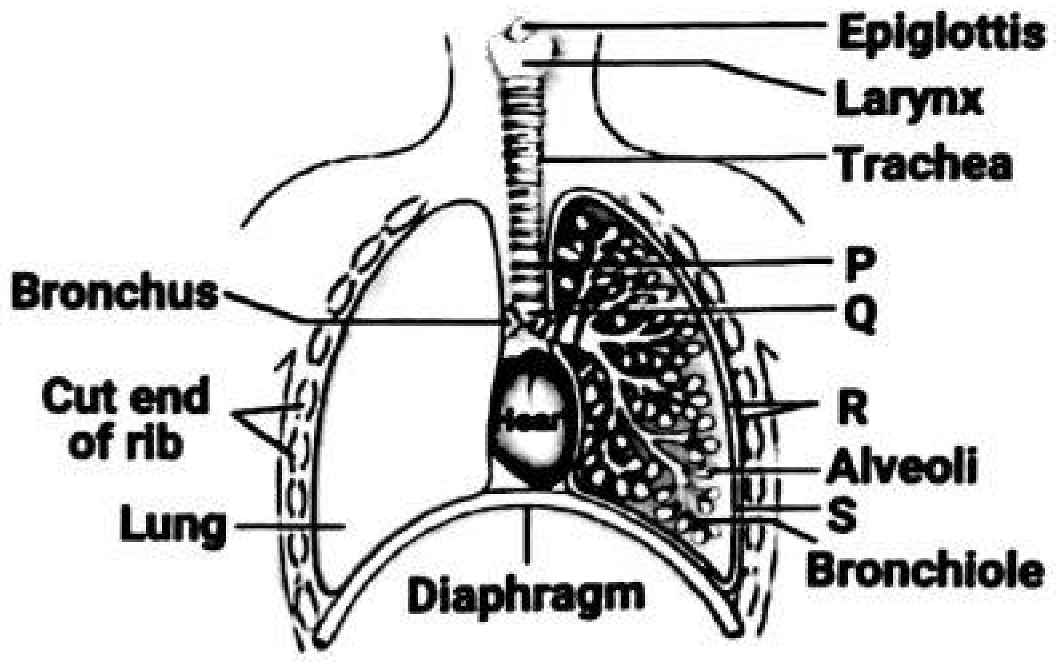
61 The growth of a root elongating at a constant rate will be represented by:



1. A only
2. B only
3. Both A and B
4. Neither A nor B

BREATHING AND EXCHANGE OF GASES

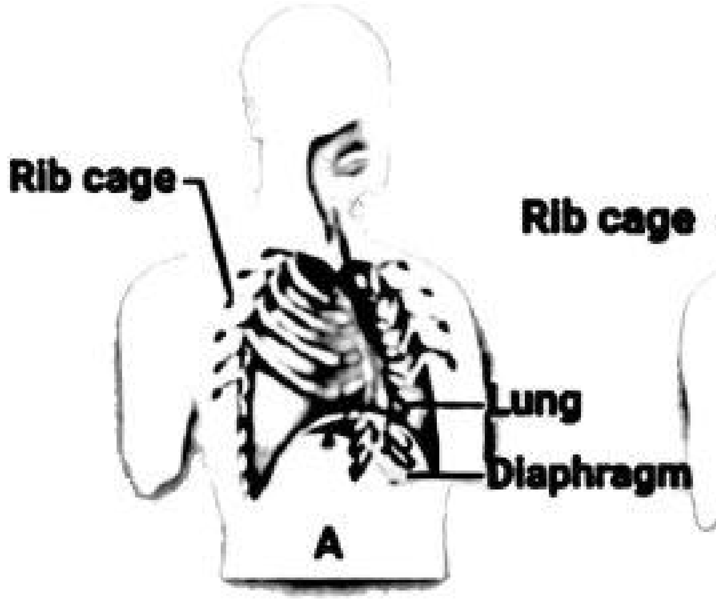
62 The given figure shows the diagrammatic view of human respiratory system (sectional view of the left lung is also shown). Regarding the parts labelled as P, Q, R and S, which of the following statements are true?



I:	P is an incomplete cartilaginous ring seen only in trachea and principal bronchus.
II:	Q is the point where the trachea divides into a right and left primary bronchus and corresponds to the level of 5th thoracic vertebra.
III:	R shows the double-layered pleura where the outer pleural membrane is in close contact with the thoracic lining.
IV:	S is pleural cavity with minimal amount of pleural fluid which reduces friction on the lung surface.

1. Only **I, II** and **III**	2. Only **I, III** and **IV**
3. Only **II, III** and **IV**	4. **I, II, III** and **IV**

63 The figure shows the events happening during the inhalation and exhalation phases of pulmonary ventilation. Read the two given statements carefully.



I:	A shows the inhalation phase brought about by the contraction of diaphragm that increases the volume of thorax in antero-posterior axis and by the contraction of external intercostal muscle that increases the volume of thorax in dorso-ventral axis.
II:	B shows the exhalation phase brought about by the relaxation of diaphragm that decreases the volume of thorax in antero-posterior axis and by the contraction of internal intercostal muscle that decreases the volume of thorax in dorso-ventral axis.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

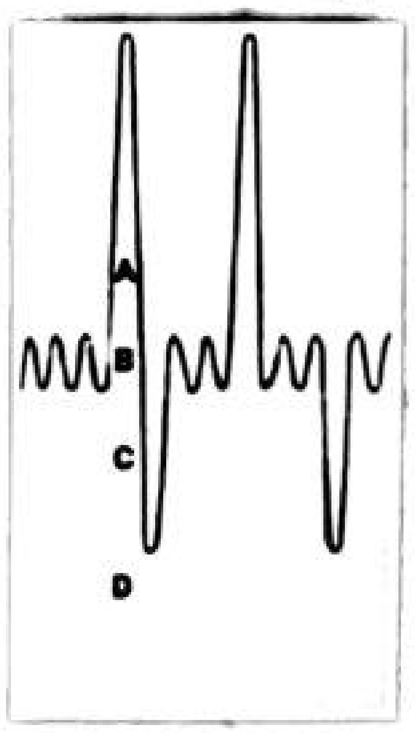
64 In inspiration during pulmonary ventilation the correct order of the given events is:
a. air flows into the lungs
b. alveolar volume increases
c. thoracic volume increases
d. pleural pressure decreases
e. alveolar pressure decreases

1.	a, b, c, d, e	2.	b, e, a, c, d
3.	c, d, b, e, a	4.	d, e, b, a, c

65 Two friends are eating together on a dining table. One of them suddenly starts coughing while swallowing some food. This coughing would have been due to improper movement of:

1.	diaphragm	2.	neck
3.	tongue	4.	epiglottis

66 The figure shows pulmonary volumes as measured on a spirometer. Which of the following will be true?



I:	A+B = Inspiratory Reserve Volume
II:	C+D = Functional Residual Capacity
III:	B+C = Tidal Volume
IV:	[(A+B+C+D) – (A+B+C)] = Residual Volume

1. Only **II** is correct
2. Only **II** and **IV** are correct
3. Only **I** and **III** are correct
4. **I, II, III** and **IV** are correct

67 The efficiency of a respiratory system is enhanced by all the following except:

1.	increasing the surface area available for diffusion of gases
2.	decreasing the distance over which the gases must diffuse
3.	increasing the concentration differences of gases inside and outside the system
4.	drying the system out so the gases do not have to diffuse through water

68

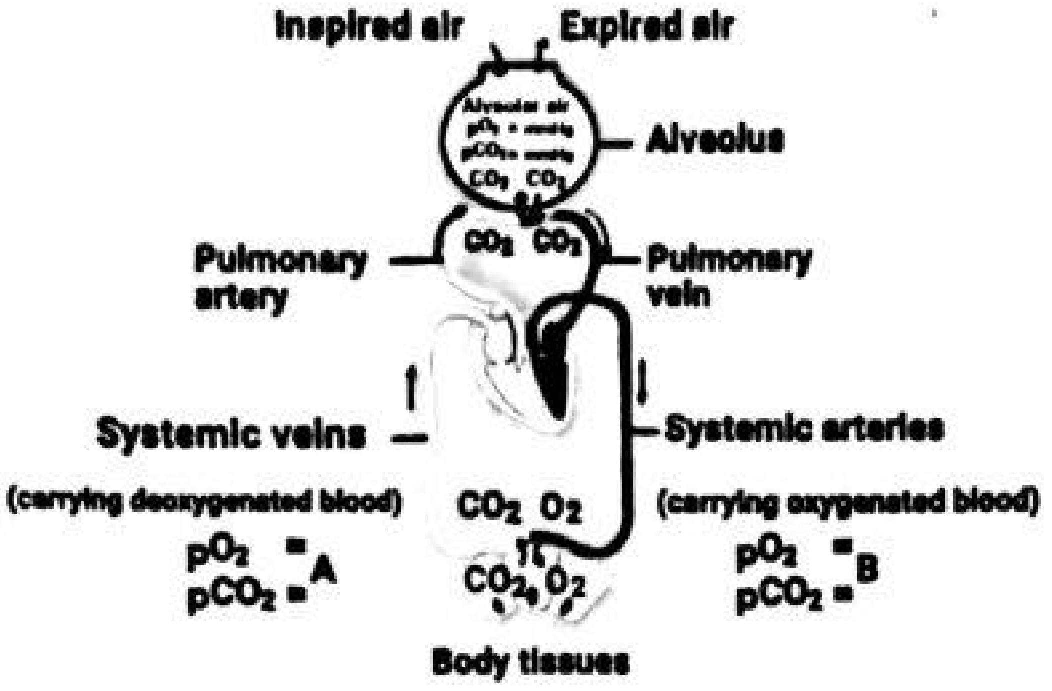

Inspired air
Expired air
Alveolus
Pulmonary artery
Pulmonary vein
Systemic veins
(carrying deoxygenated blood)
Systemic arteries
(carrying oxygenated blood)
CO_2 O_2
pO_2 =
pCO_2 =
A
B
Body tissues

Figure I

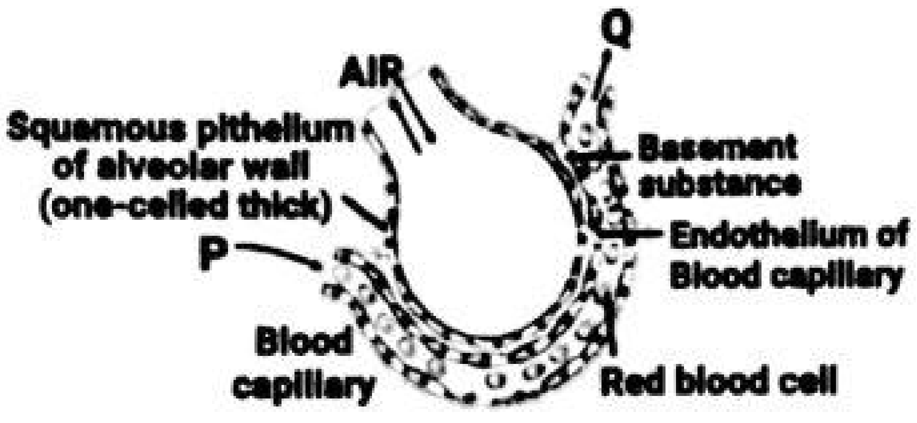

Q
AIR
Squamous pithelium of alveolar wall (one-celled thick)
P
Basement substance
Endothelium of Blood capillary
Blood capillary
Red blood cell

Figure II

I:	The partial pressures of Oxygen and Carbon dioxide at Point A in Figure I correspond to that of Point P in Figure II.
II:	The partial pressure of Carbon dioxide at Point B in Figure I corresponds to that of Point Q in Figure II.

1. Only **I** is true	2. Only **II** is true
3. **I** and **II** are true	4. **I** and **II** are false

69 Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R):

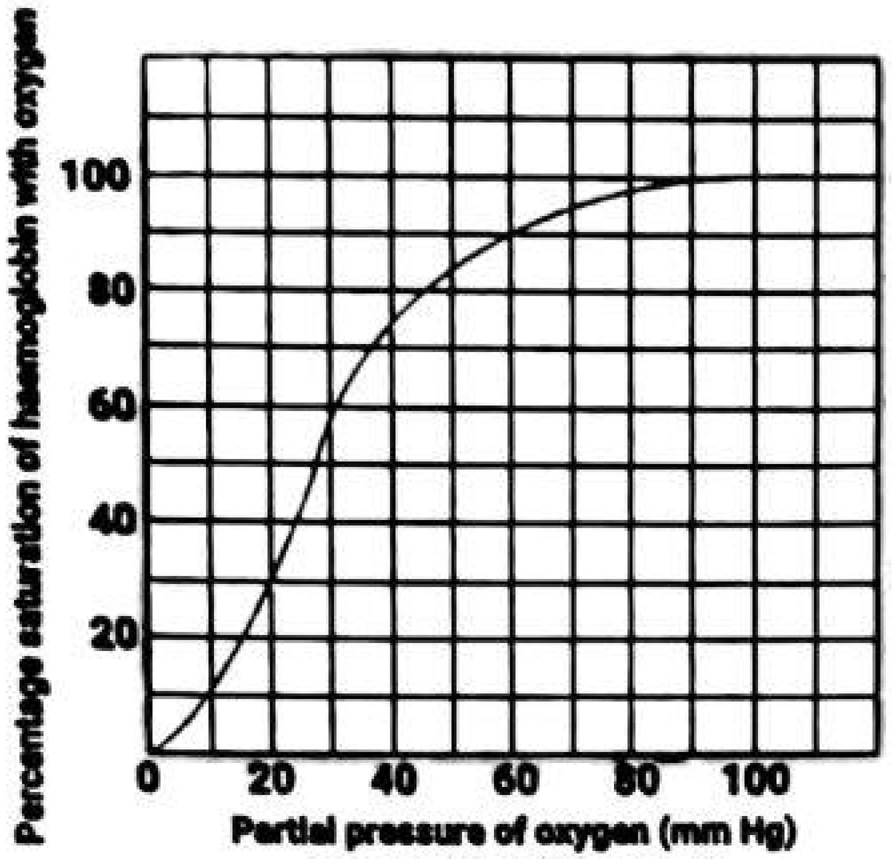
Assertion (A):	The Bohr effect enables the body to adapt to changing conditions and makes it possible to supply extra oxygen to tissues that need it the most.
Reason (R):	A lower pH in strenuously metabolizing tissues promotes the dissociation of oxygen from haemoglobin, and allows the surrounding tissues to obtain enough oxygen to meet their demands.

In the light of the above statements choose the correct answer from the options given below:

1.	Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are true but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is true but **(R)** is false.
4.	Both **(A)** and **(R)** are false.

FAT MCQs (UNIT - IV & V)

70 Study the oxygen-haemoglobin dissociation curve given in the figure and select the correct statements regarding it:

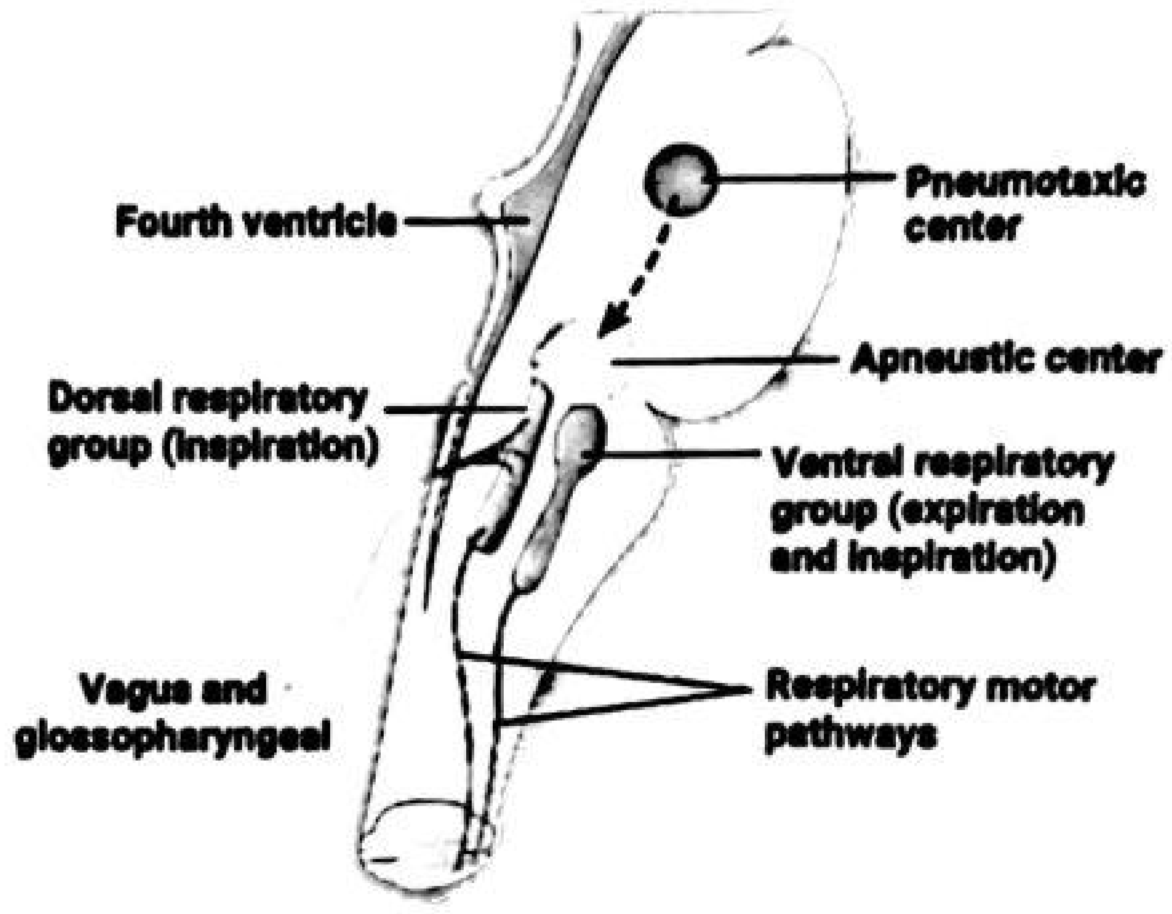


Oxygen dissociation curve

I:	The p50 is the pressure at which haemoglobin is 50% saturated which corresponds to about 27 mmHg on the X-axis.
II:	A right shift of the curve means haemoglobin holds less tightly onto oxygen and delivers more oxygen to the tissues at a given arterial oxygen pressure.

1. Only I is true
2. Only II is true
3. Both I and II are true
4. Both I and II are false

71 Study the given figure showing the neural regulation of respiration in humans and select the correct statements from the given statements.


Fourth ventricle
Pneumotaxic center
Apneustic center
Dorsal respiratory group (inspiration)
Ventral respiratory group (expiration and inspiration)
Vagus and glossopharyngeal
Respiratory motor pathways

Statement I:	The location of the pneumotaxic centre is the Pons of the brain stem and it moderates the function of respiratory rhythm centre.
Statement II:	The respiratory rhythm centre is the dorsal respiratory group shown in the figure and is also located in the Pons of the brain stem.

1. Only **Statement I** is true
2. Only **Statement II** is true
3. Both **Statement I** and **Statement II** are true
4. Both **Statement I** and **Statement II** are false

72 Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R):

Assertion (A):	Oxidized hemoglobin carries maximum oxygen in the human blood.
Reason (R):	Oxidized hemoglobin has more affinity for oxygen than deoxygenated hemoglobin.

In the light of the above statements choose the correct answer from the options given below:

1.	Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are true but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is true but **(R)** is false.
4.	Both **(A)** and **(R)** are false.

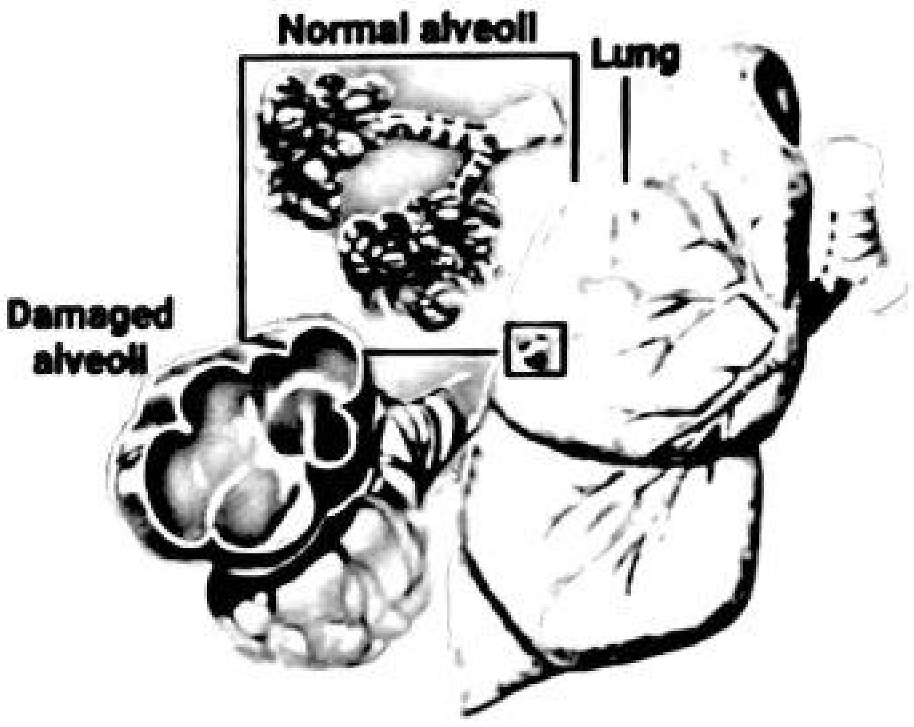
73 Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R):

Assertion (A):	Corticosteroids are very effective in the management of bronchial asthma.
Reason (R):	Corticosteroids are potent anti-inflammatory agents.

In the light of the above statements choose the correct answer from the options given below:

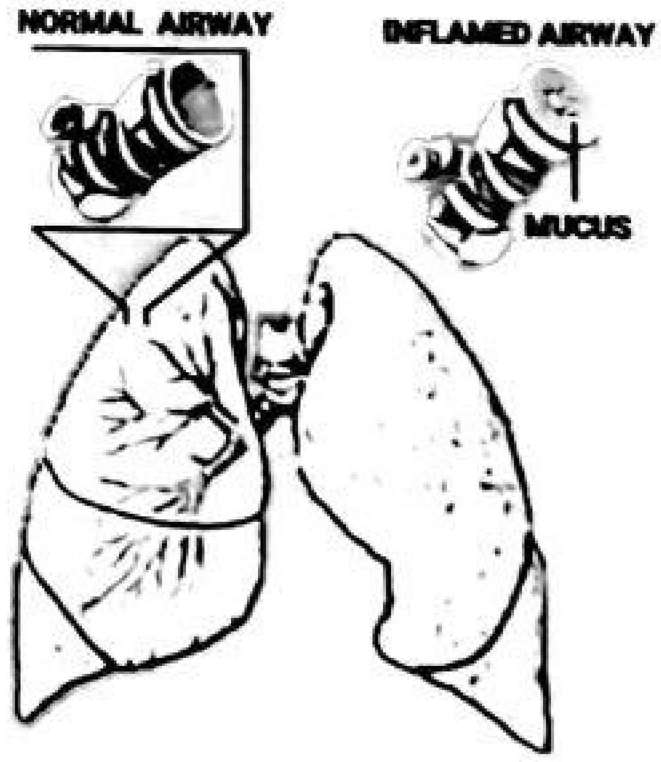
1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	Both **(A)** and **(R)** are False.

74



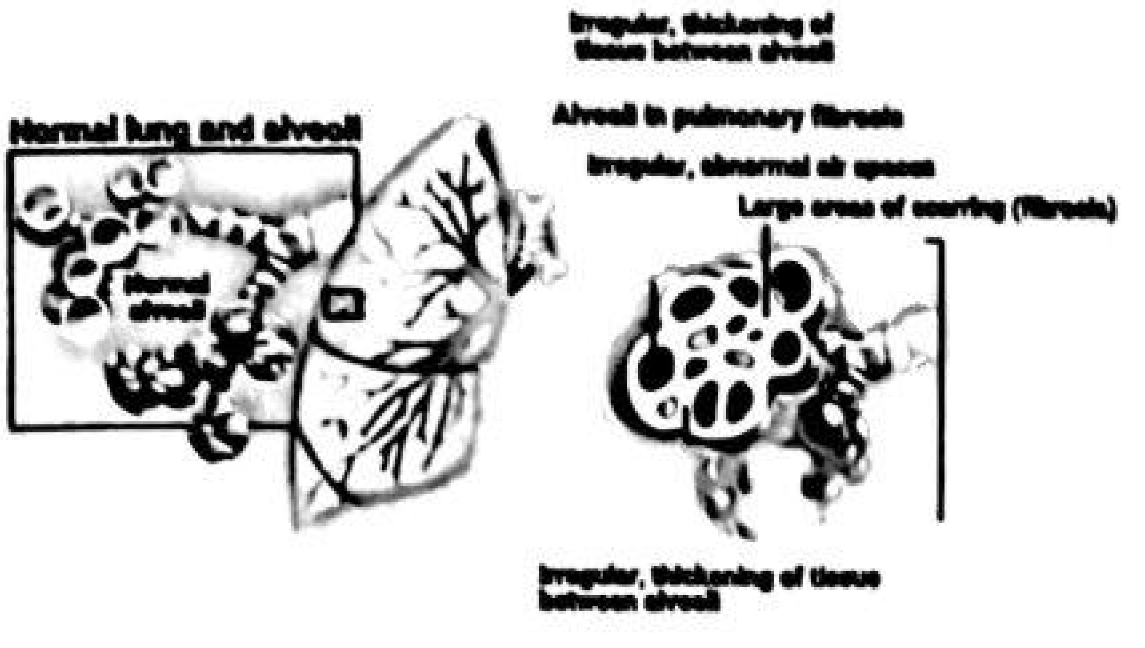
Identify the respiratory disorder shown in the figure above:
1. Bronchial asthma
2. Emphysema
3. Pneumoconiosis [occupational lung disease]
4. Tuberculosis

75 Identify the respiratory disorder shown in the given figure:



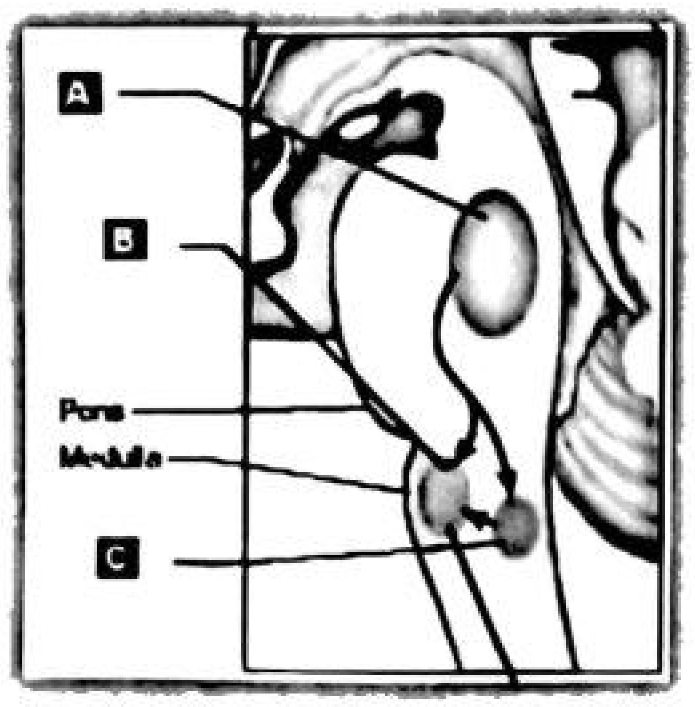
1. Bronchial asthma
2. Emphysema
3. Pneumoconiosis [occupational lung disease]
4. Tuberculosis

76 Identify the respiratory disorder shown in the given figure:


Irregular, thickening of tissue between alveoli
Normal lung and alveoli
Alveoli in pulmonary fibrosis
Irregular, abnormal air spaces
Large areas of scarring (fibrosis)
Normal alveoli
Irregular, thickening of tissue between alveoli

1. Bronchial asthma
2. Emphysema
3. Pneumoconiosis [occupational lung disease]
4. Tuberculosis

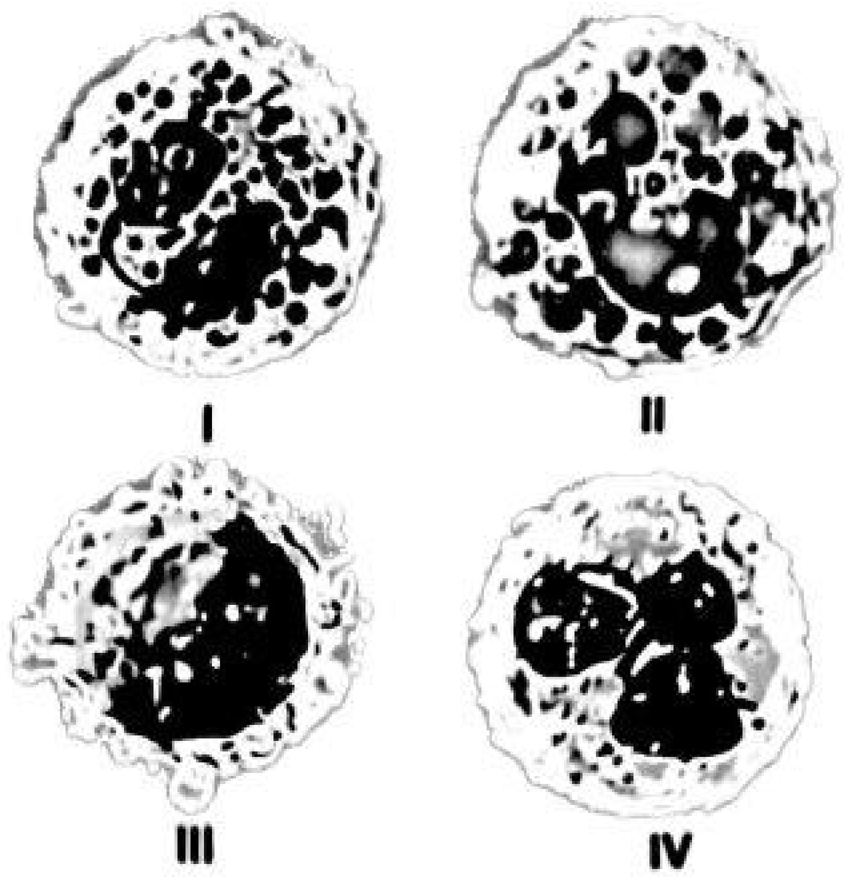
77 In the given diagram, the respiratory center that moderates the functions of the rhythm center is shown by the letter:


A
B
Pons
Medulla
C

1. A
2. B
3. C
4. Such center is not shown in the diagram

BODY FLUIDS AND CIRCULATION

78 What will be true for the white blood cells shown in the given diagram?



A:	The number of I is increased in worm infestations and II secretes histamine and heparin in the blood.
B:	III plays a vital role in acquired immunity.
C:	The number of IV is significantly reduced in acute bacterial infections.

1.	Only B	2.	Only A and B
3.	Only C	4.	A, B and C

79 Certain factors that can initiate coagulation of blood can be released by:

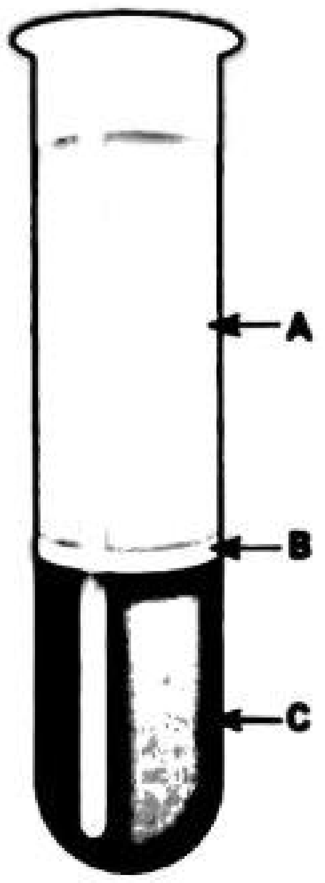
I:	Platelets in the blood
II:	Tissues at the site of injury
III:	Liver

1.	I and II only	2.	I and III only
3.	II and III only	4.	I, II and III

80 The most popularly known blood grouping is the ABO grouping. It is named ABO and not ABC, because O in it refers to having

1.	No antigens A or B on RBCs.
2.	Other antigens besides A and B on RBCs.
3.	Overdominance of this type on the genes for A and B types.
4.	One antibody only (either anti-A and anti-B) on the RBCs.

81 The following diagram shows blood components after centrifugation of a blood sample. Which of the following options are correctly matched?

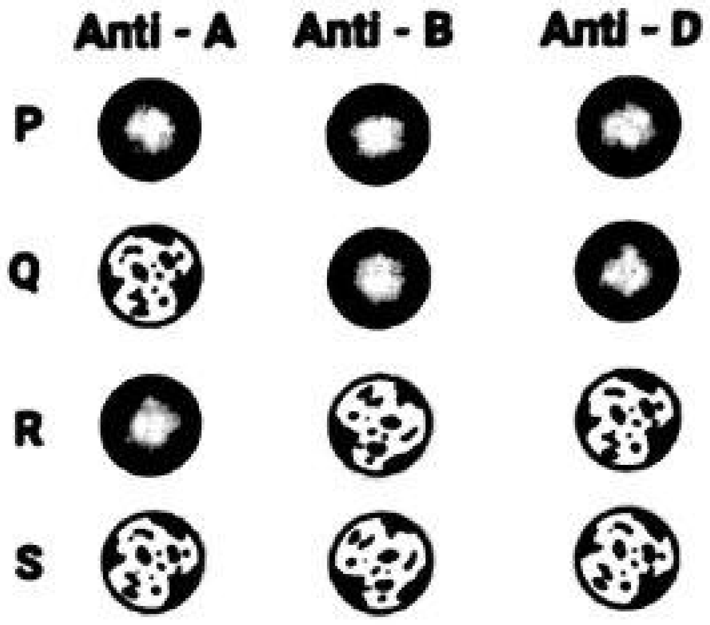


A:	Plasma	55%
B:	Buffy coat	WBCs and Platelets
C:	RBC	Approx. 45 %

Options:

1.	Only A and B	2.	Only A and C
3.	Only B and C	4.	A, B and C

82 Typically, blood type tests are performed through addition of a blood sample to a solution containing antibodies corresponding to each antigen. The presence of an antigen on the surface of the blood cells is indicated by agglutination. Predict the blood groups in results P, Q, R and S:



	P	Q	R	S
1.	O positive	A negative	B positive	AB negative
2.	O positive	A negative	B negative	AB positive
3.	O negative	A positive	B negative	AB negative
4.	O negative	A negative	B positive	AB positive

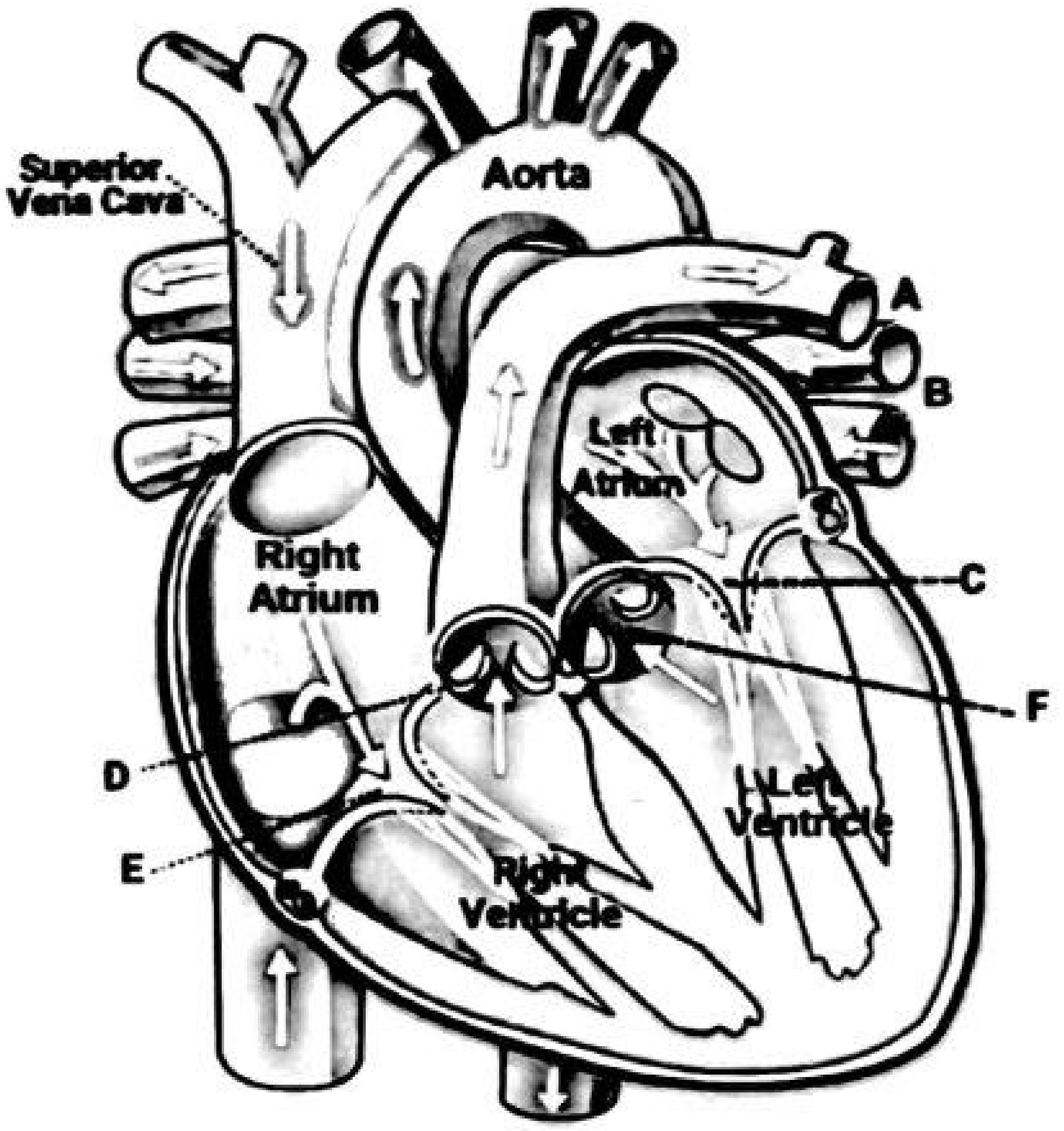
83 Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R):

Assertion (A):	Lymph that enters the lymph vessels from the interstitial spaces usually does not flow backwards along the vessels.
Reason (R):	Unlike the cardiovascular system, the lymphatic system is not closed and has no central pump.

In the light of the above statements choose the correct answer from the options given below:

1.	Both (A) and (R) are True and (R) is the correct explanation of (A).
2.	Both (A) and (R) are True but (R) is not the correct explanation of (A).
3.	(A) is True but (R) is False.
4.	Both (A) and (R) are False.

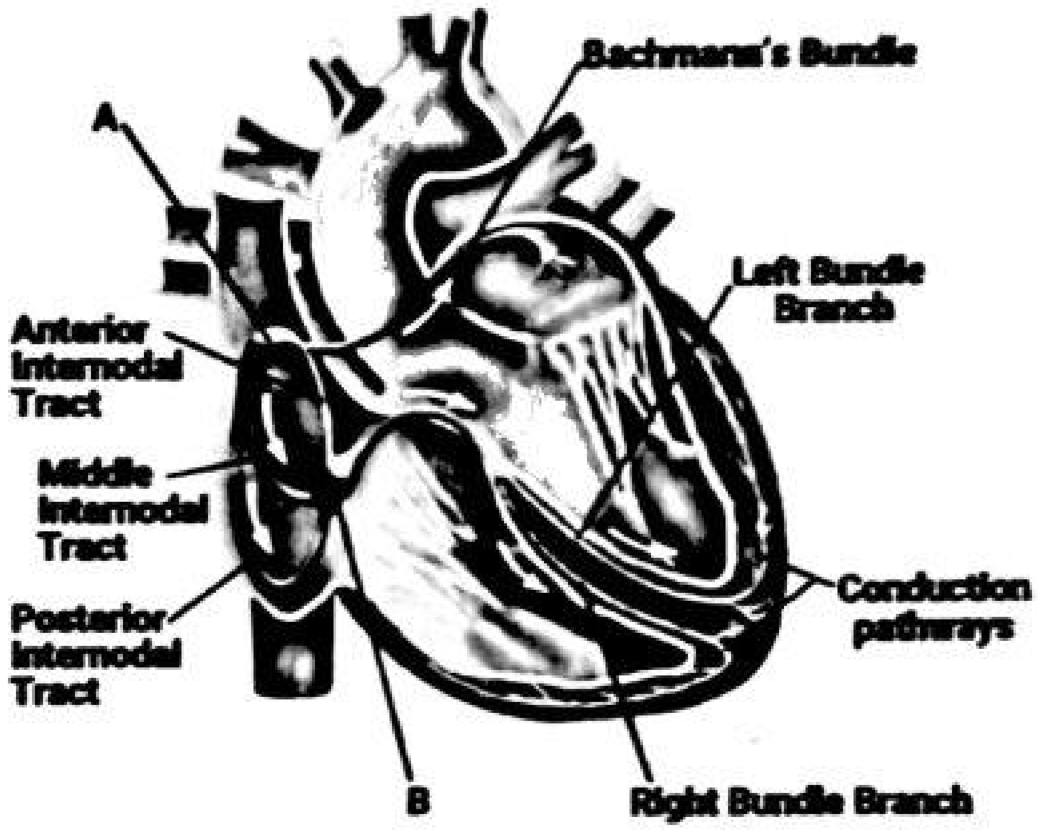
84 Identify the correct statements regarding the labelled structures shown in the given diagram of the human heart:


Superior Vena Cava
Aorta
A
B
Left Atrium
Right Atrium
C
F
D
E
Left Ventricle
Right Ventricle

Statement I:	A carries oxygenated blood and B carries deoxygenated blood.
Statement II:	D and C close simultaneously during the beginning of ventricular diastole.
Statement III:	E and F close simultaneously during the beginning of ventricular systole.

1. Only **Statement I**
2. Only **Statement II** and **Statement III**
3. None of the three statements is true
4. **Statement I, Statement II** and **Statement III**

85 Consider the given statements regarding the nodal tissue of human heart as shown in the given diagram:


A
Bachmann's Bundle
Left Bundle Branch
Anterior Internodal Tract
Middle Internodal Tract
Posterior Internodal Tract
Conduction pathways
B
Right Bundle Branch

I:	A is the normal pacemaker of the human heart and B is the pace-setter of the human heart.
II:	While A is made up of muscle tissue, B is made up of neural tissue.

1. Only I is correct
2. Only II is correct
3. Both I and II are correct
4. Both I and II are incorrect

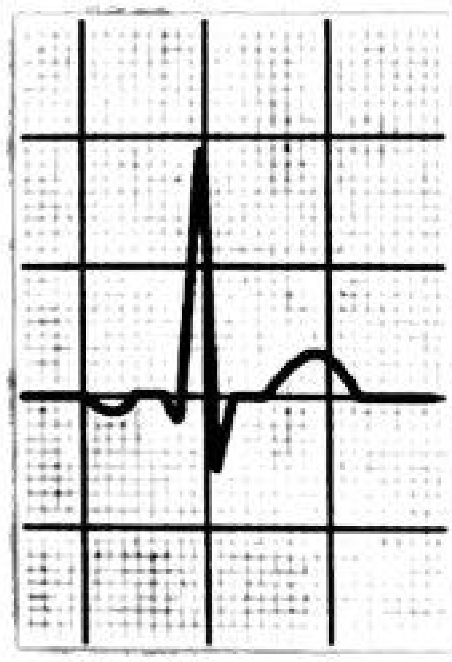
86 Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R):

Assertion (A):	The delay in the conduction of the impulse at the AV node is critical to the normal functioning of the human heart.
Reason (R):	It ensures that the atria have ejected their blood into the ventricles before the ventricles contract.

In the light of the above statements choose the correct answer from the options given below:

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	Both **(A)** and **(R)** are False.

87 If you compare with the normal ECG tracing given in your NCERT, the following ECG shows an abnormal:

1. P wave 2. R wave 3. S wave 4. T wave	

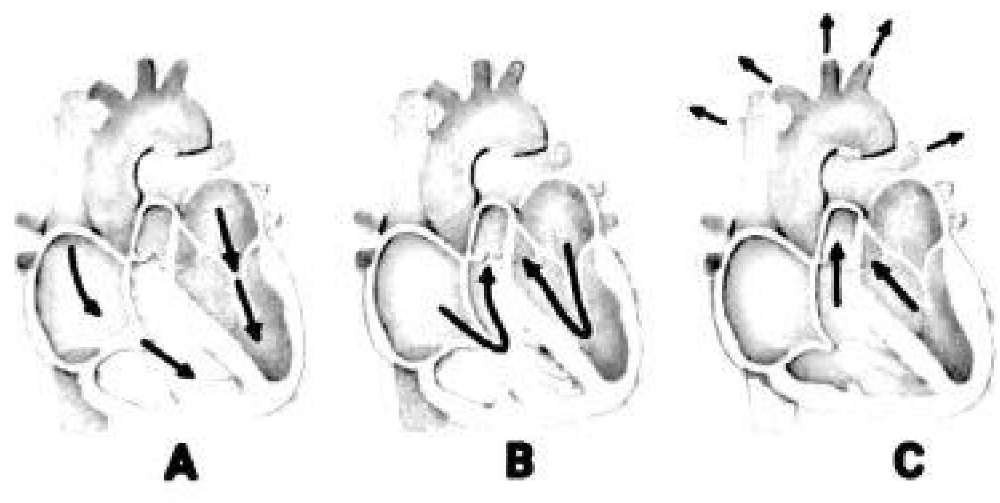
88 Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R):

Assertion (A):	The increased efficiency of the double circulatory system in mammals and birds is thought to have been important in the evolution of endothermy.
Reason (R):	Crocodile, a reptile, is not an endotherm in spite of having a four chambered heart.

In the light of the above statements choose the correct answer from the options given below:

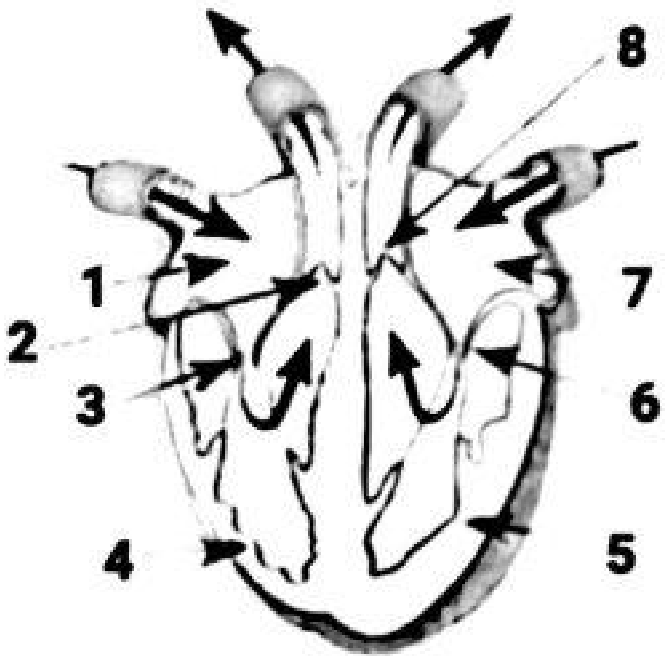
1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	Both **(A)** and **(R)** are False.

89 During which stage of the cardiac cycle, as shown in the given figure, does active ventricular filling take place?



1.	A	2.	B
3.	C	4.	None

90 Consider the diagram of the human heart with various parts labeled as numbers. All statements given will be correct except:



1.	Simultaneous closure of 3 and 6 produces first heart sound
2.	Simultaneous closure of 2 and 8 produces second heart sound
3.	5 pumps more blood than 4 as it has thicker musculature
4.	Both 1 and 7 receive venous blood

91 Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R):

Assertion (A):	The left ventricle pumps the blood with greater force than the right ventricle.
Reason (R):	The left ventricle pumps more blood than the right ventricle during each contraction.

In the light of the above statements choose the correct answer from the options given below:

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	Both **(A)** and **(R)** are False.

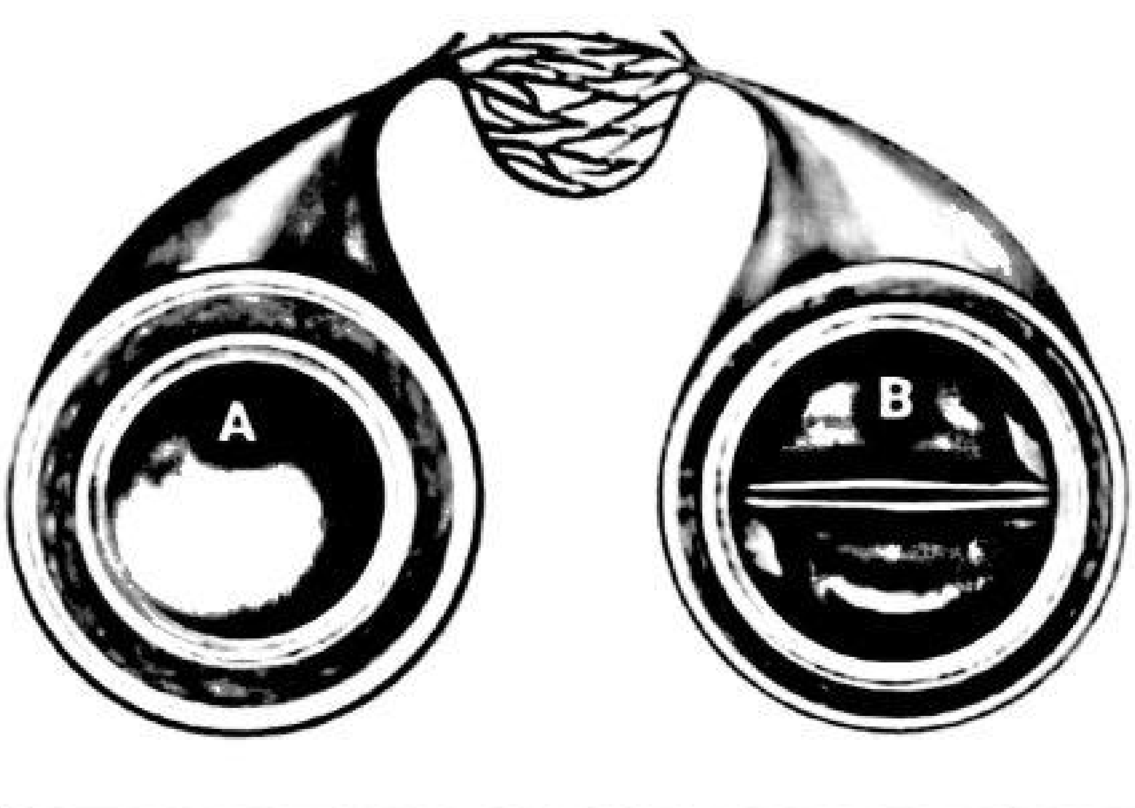
92 Match Column I and Column II :

Column I	Column II
(a) P-wave	(i) Depolarisation of ventricles
(b) QRS complex	(ii) Repolarisation of ventricles
(c) T-wave	(iii) Coronary ischemia
(d) Reduction in the size of T-wave	(iv) Depolarisation of atria
	(v) Repolarisation of atria

Select the correct option:

	(a)	(b)	(c)	(d)
1.	(ii)	(iii)	(v)	(iv)
2.	(iv)	(i)	(ii)	(iii)
3.	(iv)	(i)	(ii)	(v)
4.	(ii)	(i)	(v)	(iii)

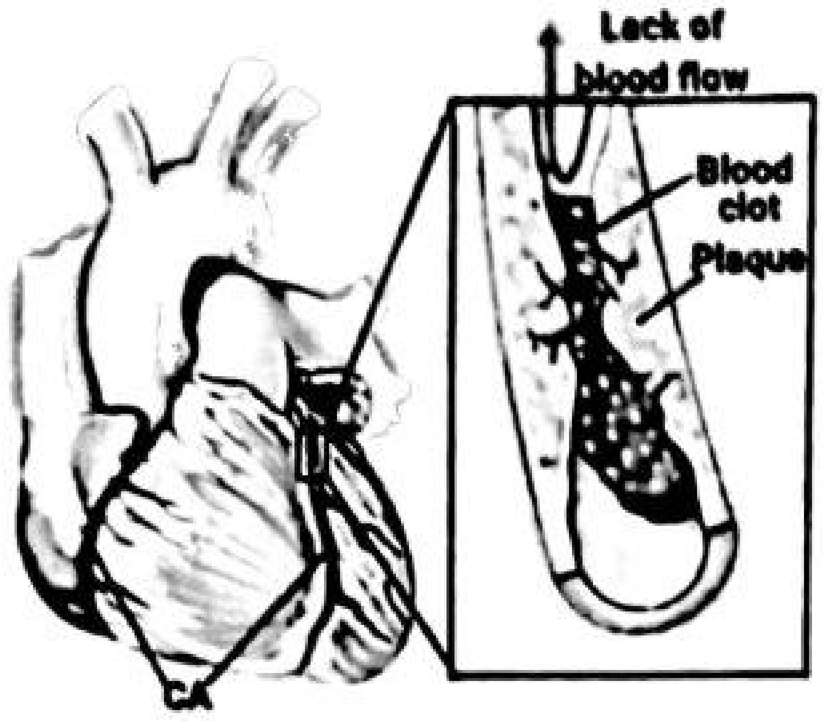
93 A in the given diagram shows the anatomy of an artery and B shows the anatomy of a vein. This is true because:



I:	The tunica media in the wall of the artery is thicker than the tunica media in the wall of the vein.
II:	Artery is shown in red colour as all arteries without exception carry oxygenated blood and vein is shown in blue colour as all arteries without exception carry deoxygenated blood.

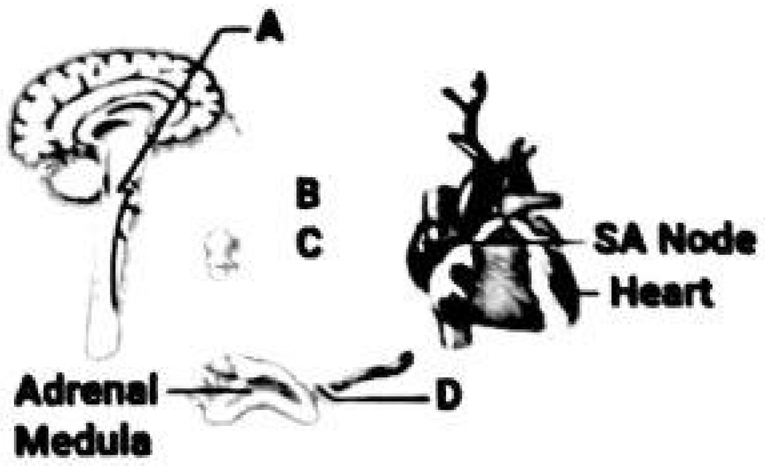
1. Only I is correct
2. Only II is correct
3. Both I and II are correct
4. Both I and II are incorrect

94 The given diagram shows:



1.	atherosclerosis in the blood vessel that causes coronary artery disease
2.	narrowing of lumen of coronary artery that causes congestive heart failure
3.	vasoconstriction of the lumen of coronary artery that causes angina pectoris
4.	the collection of platelets in blood vessel caused by viral infections like dengue that can damage the heart muscle

95 Study the given diagram regarding regulation of cardiac activity. Identify the correctly matched pairs from the options given in the table:

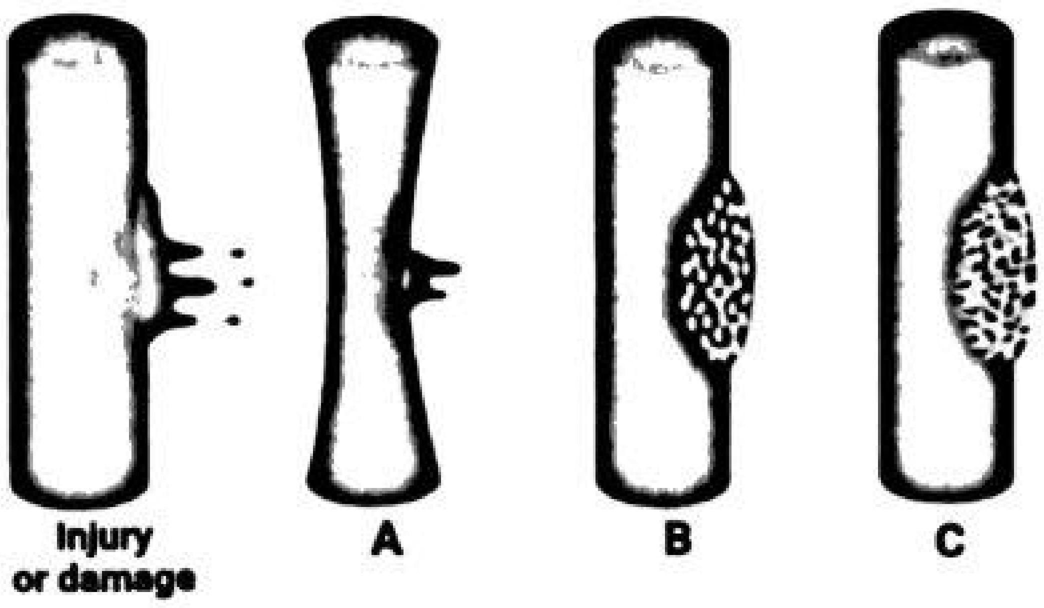


I:	A	Cardiac centre in Medulla oblongata
II:	B and C	Subdivisions of Autonomic Neural System having antagonist effects on heart
III:	D	Catecholamines acting both as neurotransmitters and hormones

Options:

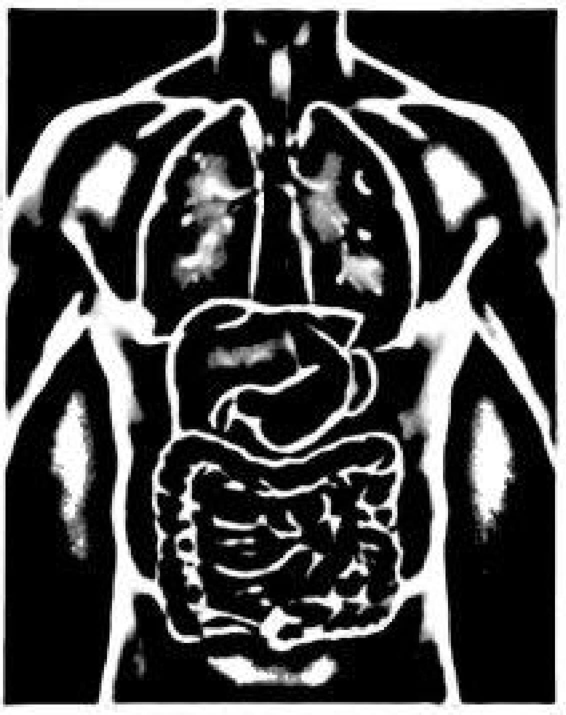
1.	Only I and II	2.	Only I and III
3.	Only II and III	4.	I, II and III

96 A, B and C are the events of haemostasis in chronological sequence that take place after injury or damage to a blood vessel. Identify them:



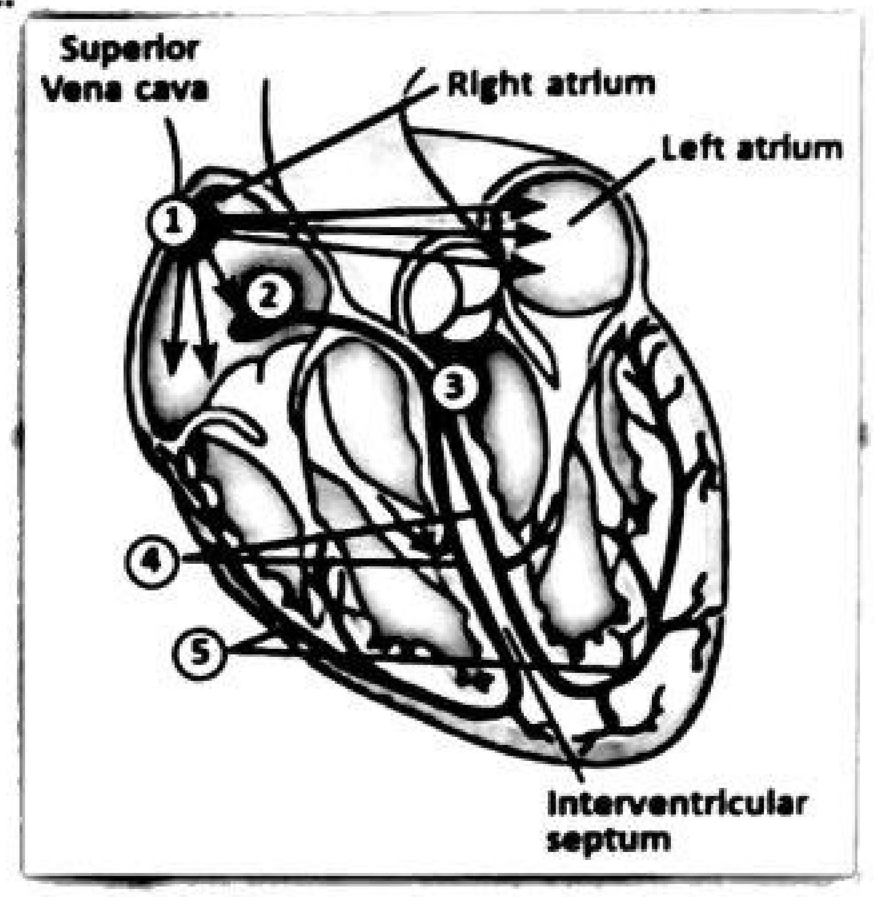
	A	B	C
1.	Vessel contracts	Platelet plug formation	Fibrin clot formation
2.	Vessel dilates	Platelet plug formation	Fibrin clot formation
3.	Vessel contracts	Fibrin clot formation	Platelet plug formation
4.	Vessel dilates	Fibrin clot formation	Platelet plug formation

97 The organ highlighted is the grave yard of old RBCs. Name it.



1. Spleen
2. Liver
3. Gall Bladder
4. Colon

98 Study the given diagram and identify the correct statement.



1. If 1 is damaged, heart will stop
2. 2 ensures that atria contract prior to ventricles
3. 4 has the highest conduction velocity
4. 3 is the bundle of nerve fibers that carry impulses to the ventricles

EXCRETORY PRODUCTS AND THEIR ELIMINATION

99 Urea is:

1. more toxic than ammonia
2. produced in kidneys
3. energetically more expensive to produce than ammonia
4. never present in human blood

100 Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R):

Assertion (A):	Excreting uric acid in birds and reptiles with shelled eggs conveys a selective advantage.
Reason (R):	Uric acid is more energetically expensive than urea.

In the light of the above statements choose the correct answer from the options given below:

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	Both **(A)** and **(R)** are False.

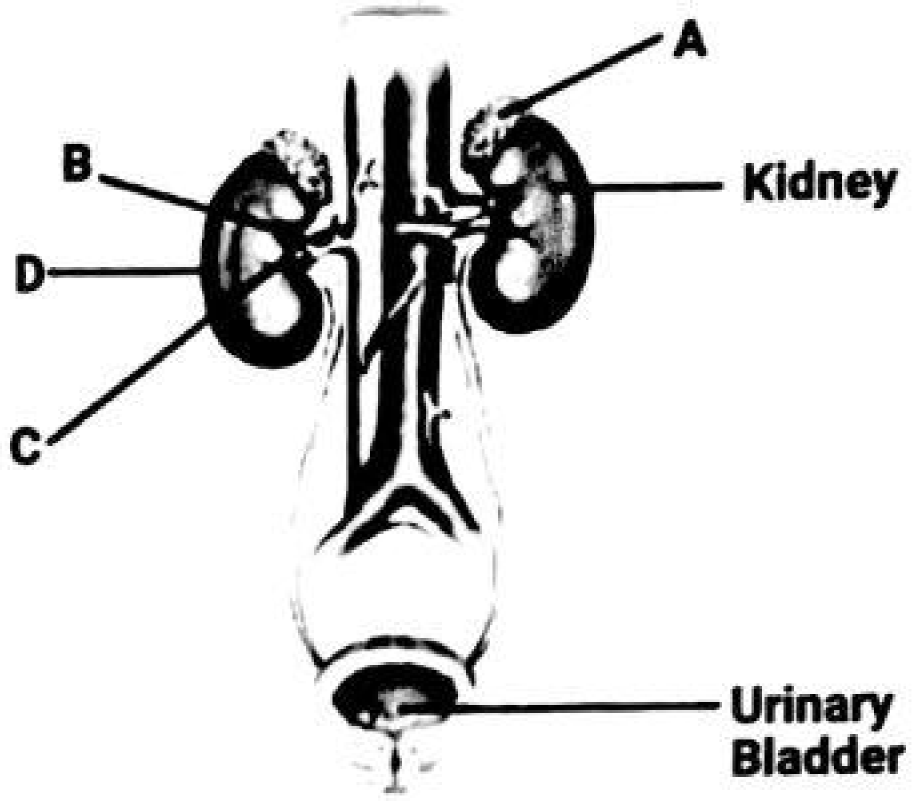
101 Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R):

Assertion (A):	The filtration step common to other excretory systems in Malpighian tubules is absent.
Reason (R):	Malpighian tubules in insects serve in excretion and osmoregulation.

In the light of the above statements choose the correct answer from the options given below

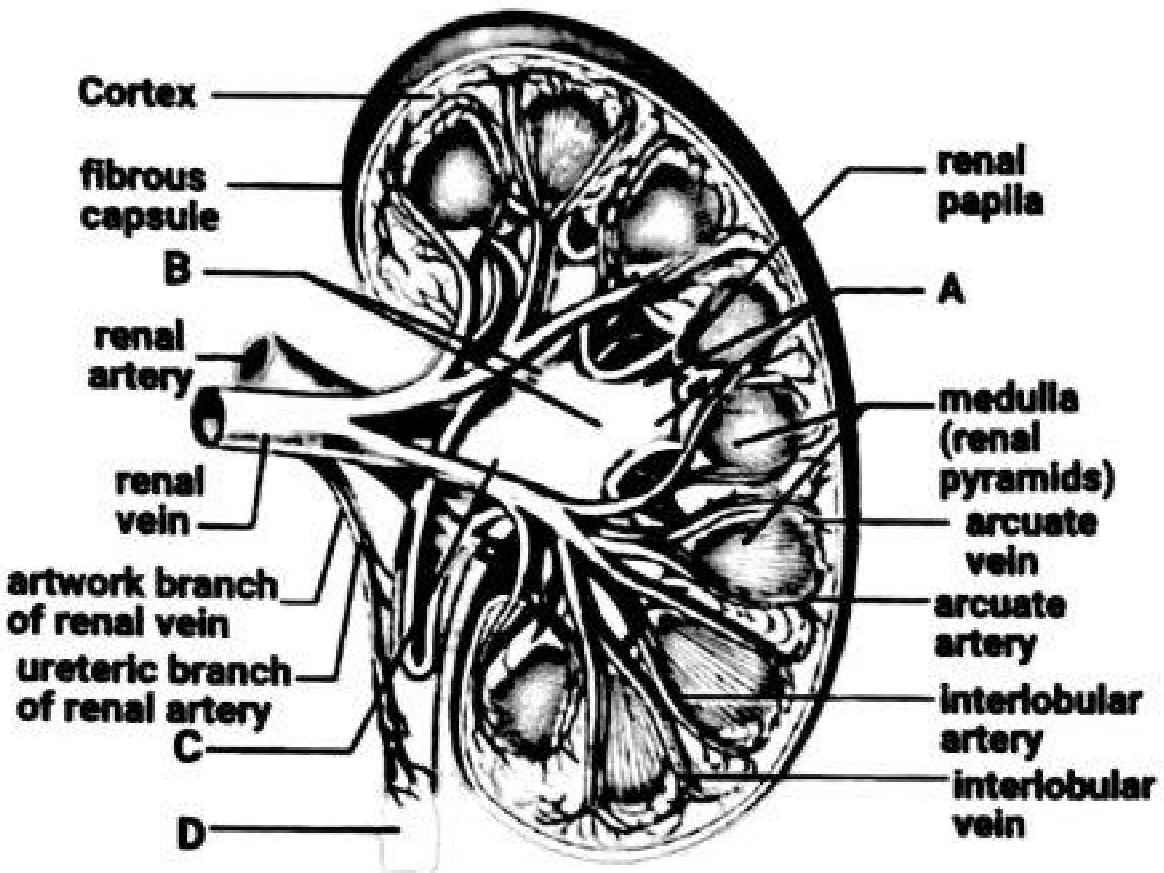
1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	Both **(A)** and **(R)** are False.

102 Figure shows human urinary system with structures labelled A to D. Select option which correctly identifies them and gives their characteristics and / or functions.



1.	B-pelvis - broad funnel shaped space inner to hilum, directly connected to loops of Henle.
2.	C- Medulla- inner zone of kidney and contains complex nephrons.
3.	D- Cortex- outer part of kidney and does not contain any part of nephrons.
4.	A- Adrenal gland- located at the anterior part of kidney; secretes catecholamines which stimulate glycogen breakdown.

103 Given figure shows a sagittal section of human kidney. Identify A, B, C and D:


Cortex
fibrous capsule
B
renal artery
renal vein
artwork branch of renal vein
ureteric branch of renal artery
C
D
renal papila
A
medulla (renal pyramids)
arcuate vein
arcuate artery
interlobular artery
interlobular vein

	A	B	C	D
1.	Minor calyx	Major calyx	Renal pelvis	Urethra
2.	Major calyx	Minor calyx	Renal pelvis	Ureter
3.	Minor calyx	Major calyx	Renal pelvis	Ureter
4.	Minor calyx	Major calyx	Renal pectoral	Urethra

104 What adaptation would be seen in the kidneys of a mammal living in desert when compared to the kidneys in aquatic mammals?

1.	A higher percentage of cortical nephrons with short loop of Henle extending slightly into the medulla
2.	A higher percentage of cortical nephrons with long loop of Henle extending deep into the medulla
3.	A higher percentage of juxtamedullary nephrons with long loop of Henle extending deep into the medulla
4.	Presence of only juxtamedullary nephrons with long loop of Henle extending deep into the medulla

105 The functions of human kidneys include:

I:	Formation of urine
II:	Regulation of erythropoiesis
III:	Regulation of calcium levels in body fluids

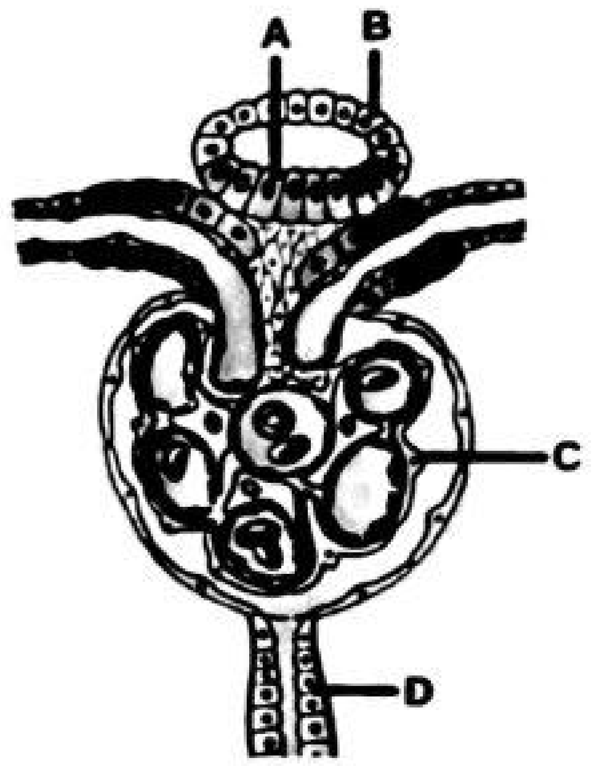
1.	Only I	2.	Only I and II
3.	Only II and III	4.	I, II and III

106 Consider the given two statements:

I:	Vasa recta is absent or highly reduced in cortical nephrons.
II:	Efferent arteriole forms a peritubular capillary network around renal tubules.

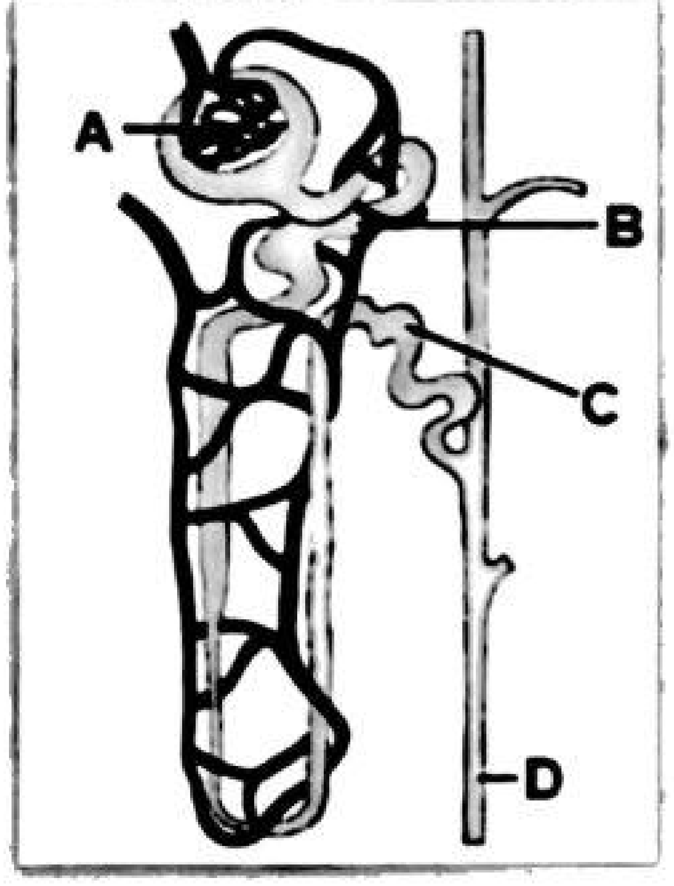
1. I is correct but II is incorrect
2. I is incorrect but II is correct
3. I is correct and II is also correct
4. I is incorrect and II is also incorrect

107 Which letter represents the podocytes in the given diagram:



1.	A	2.	B
3.	C	4.	D

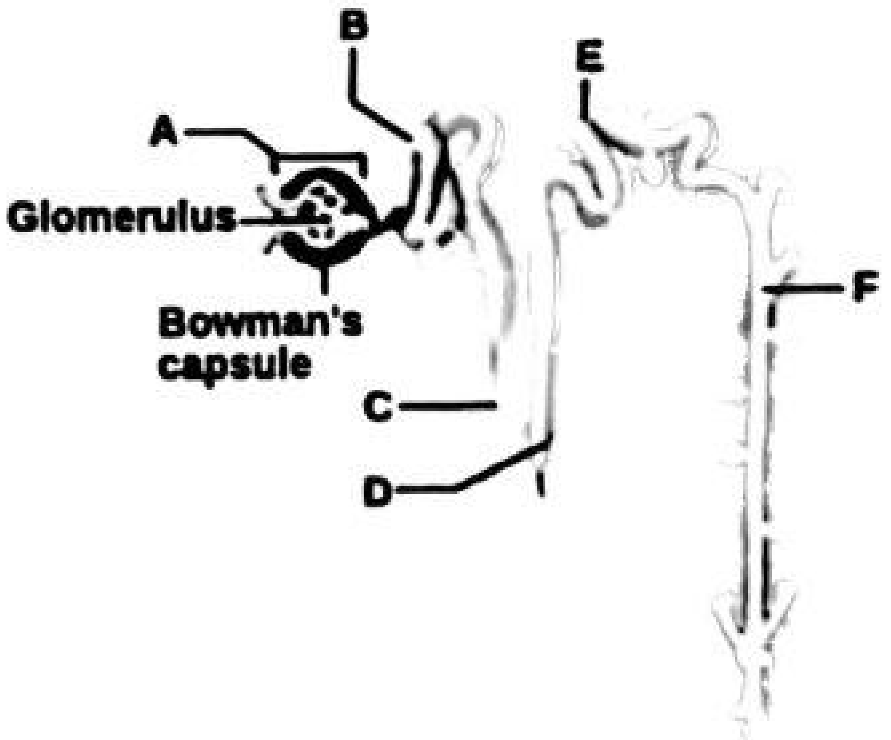
108 Refer the given figure of nephron.



Identify A, B, C, and D and select the correct option regarding them.

1.	A - Glomerulus - a tuft of capillaries formed by afferent arteriole.
2.	B - PCT- reabsorption of HCO_3^- and selective secretion of H^+ and K^+ occurs here.
3.	C - DCT- almost all glucose, amino acids, water, Na^+, K^+, and uric acid are absorbed here.
4.	D - collecting duct - extends from the cortex of the kidney to the inner parts of the medulla; a large amount of water is secreted in this region.

109 Identify the correctly matched rows regarding A-F in the given figure:



A.	Malpighian body	Site for ultra-filtration
B.	Proximal convoluted tubule	Maximum reabsorption of filtrate
C.	Descending limb of loop of Henle	Permeable to water; almost impermeable to electrolytes
D.	Ascending limb of loop of Henle	Impermeable to water; allows transport of electrolytes
E.	Distal convoluted tubule	Conditional reabsorption of sodium and water
F.	Collecting duct	Concentration of urine; allows passage of urea

Options:

1.	All except C and D	2.	All except B and E
3.	All except F	4.	All

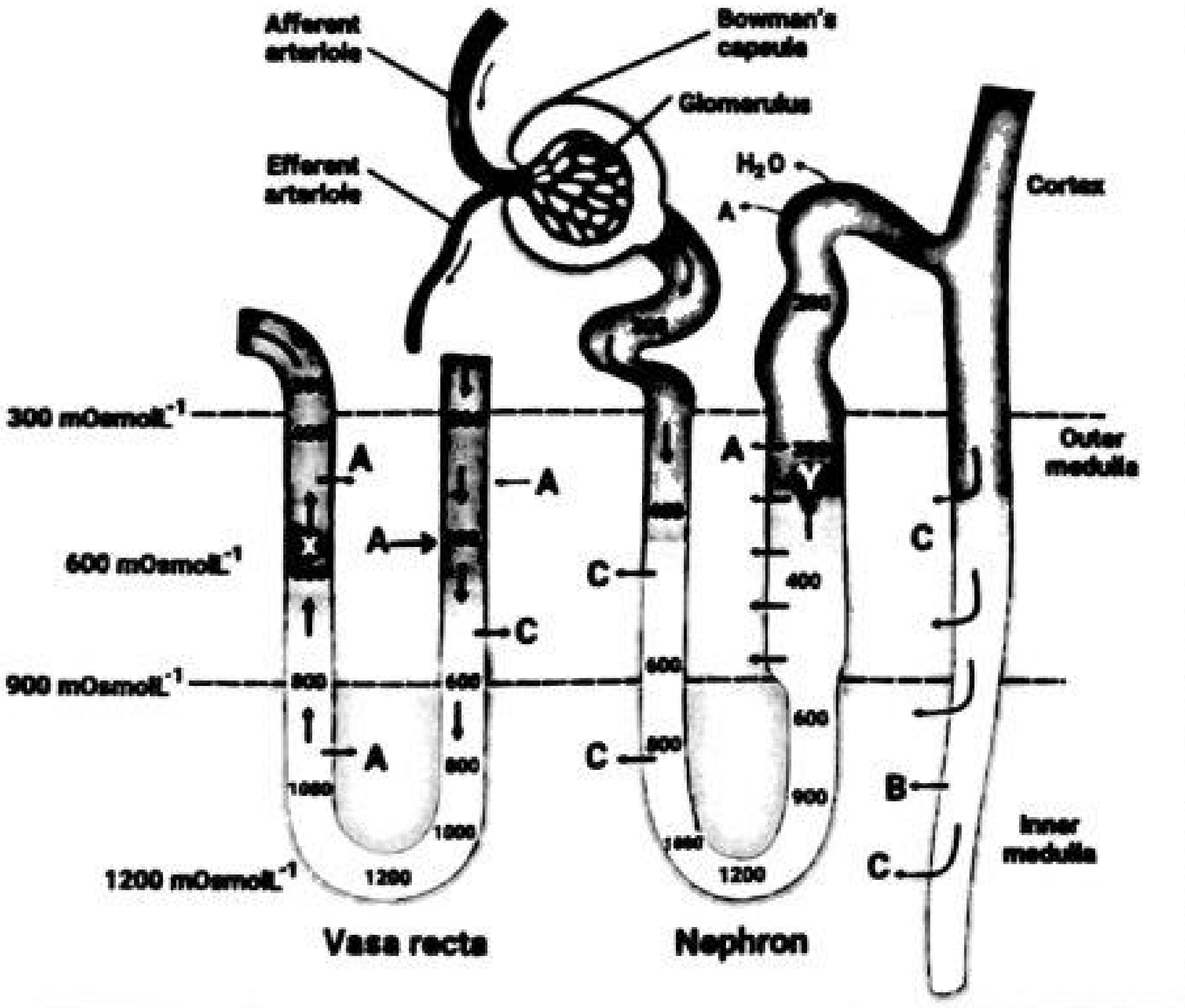
110 Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R):

Assertion (A):	Anti diuretic hormone release is increased when blood osmolarity increases such as after eating salty foods or losing water through sweating.
Reason (R):	ADH temporarily decreases the number of aquaporins inserted in the membranes of collecting duct cells.

In the light of the above statements choose the correct answer from the options given below:

1.	Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are true but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is true but **(R)** is false.
4.	Both **(A)** and **(R)** are false.

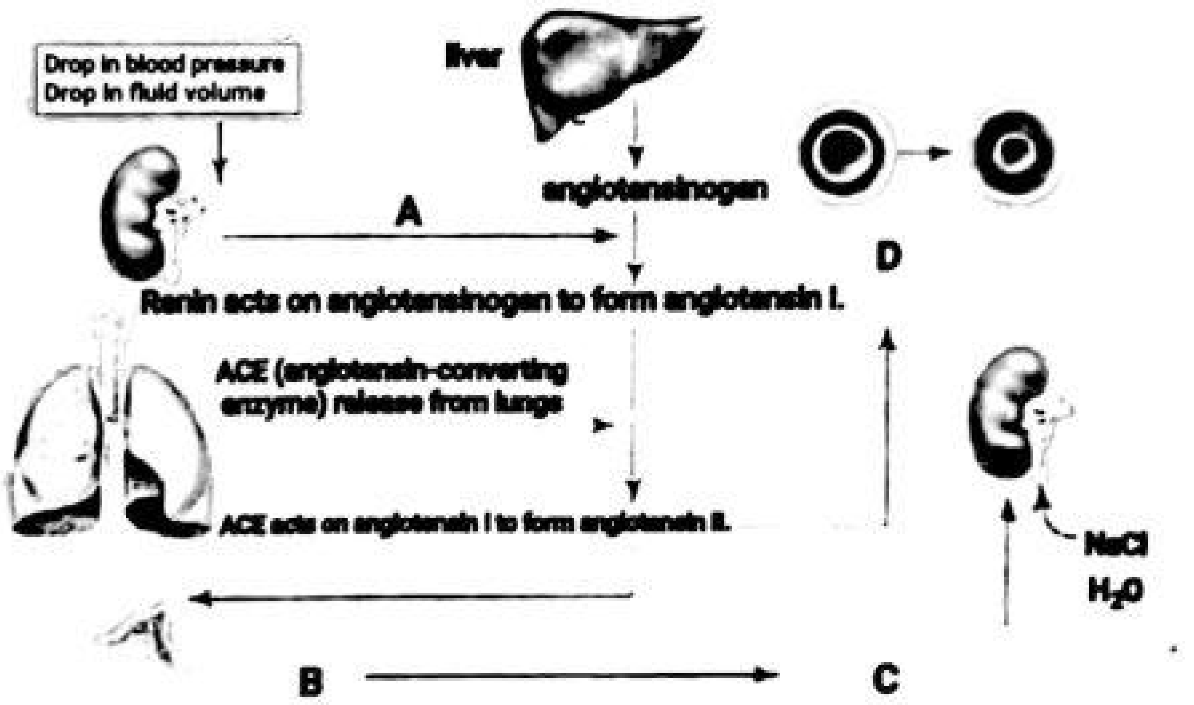
111 The figure shows a diagrammatic representation of a nephron and vasa recta showing counter current mechanisms. Identify the correct statements:


Afferent arteriole
Bowman's capsule
Glomerulus
Efferent arteriole
H_2O
A
Cortex
300 mOsmolL^{-1}
600 mOsmolL^{-1}
900 mOsmolL^{-1}
1200 mOsmolL^{-1}
Outer medulla
Inner medulla
A
A
A
A
X
Y
C
C
C
C
C
B
400
600
600
800
900
1000
1200
Vasa recta
Nephron

I:	A is NaCl which is transported by the ascending limb of Henle's loop, exchanged with the ascending limb of vasa recta and returned to the interstitium by the descending portion of vasa recta.
II:	B is urea which enters the thin segment of the ascending limb of Henle's loop and is transported back to the interstitium by the collecting tubule.
III:	C is water.

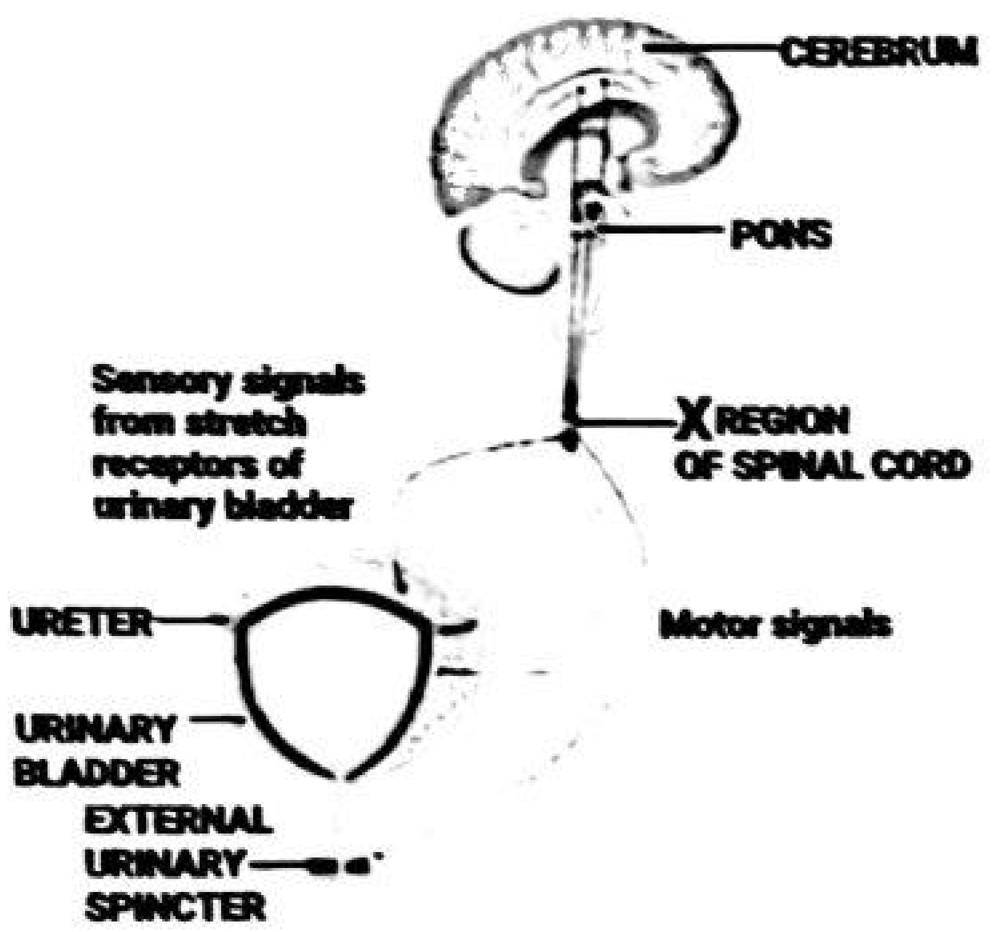
1.	Only I and II	2.	Only II and III
3.	Only I and III	4.	I, II and III

112 The given diagram shows the schematic functioning of the Renin Angiotensin Aldosterone System in the regulation of kidney function. Identify A, B, C and D:


Drop in blood pressure
Drop in fluid volume
liver
angiotensinogen
A
D
Renin acts on angiotensinogen to form angiotensin I.
ACE (angiotensin-converting enzyme) release from lungs
ACE acts on angiotensin I to form angiotensin II.
NaCl
H_2O
B
C

	A	B	C	D
1.	Renin released from kidney	Angiotensin II stimulates adrenal medulla to secrete aldosterone	Reabsorption of sodium and water	Vaso-dilation
2.	Renin released from kidney	Angiotensin II stimulates adrenal cortex to secrete aldosterone	Reabsorption of sodium and water	Vaso-constriction
3.	ADH released from kidney	Angiotensin II stimulates adrenal cortex to secrete aldosterone	Diuresis	Vaso-constriction
4.	Angio-tensin I released from kidney	Angiotensin II stimulates adrenal cortex to secrete aldosterone	Reabsorption of sodium and water	Vaso-dilation

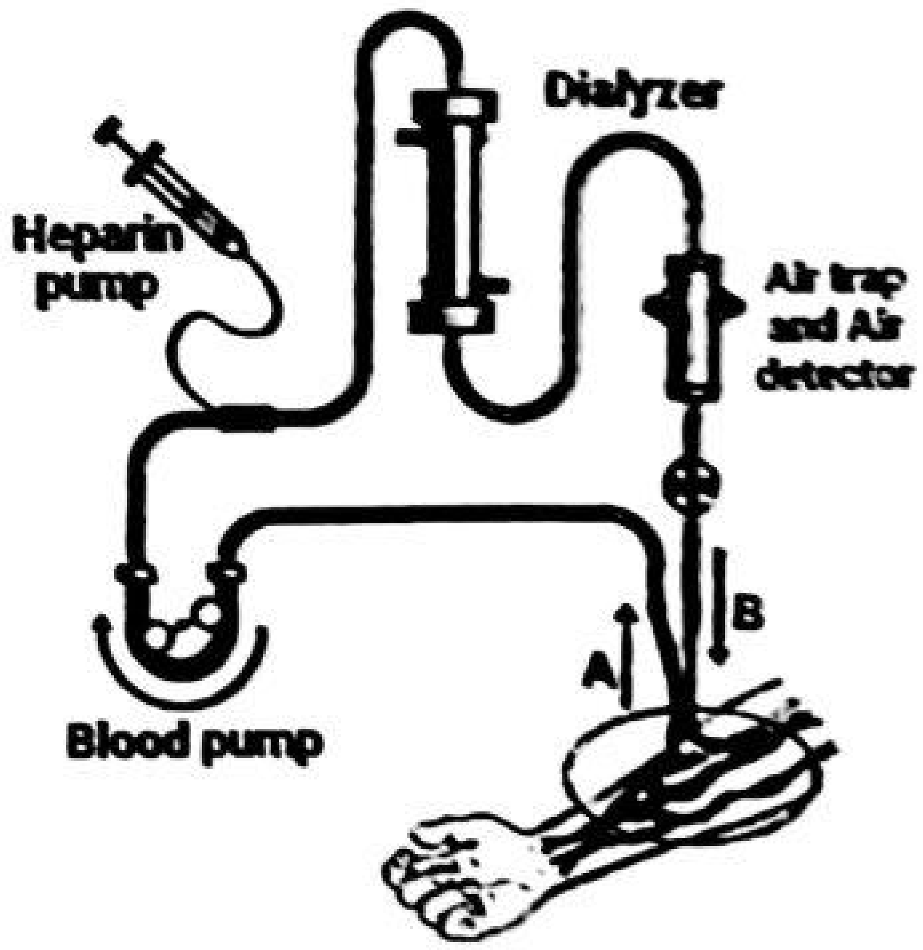
113 Given below is a diagram showing the functioning of the micturition reflex in humans. Identify the correct statements:


CEREBRUM
PONS
Sensory signals from stretch receptors of urinary bladder
X REGION OF SPINAL CORD
URETER
Motor signals
URINARY BLADDER
EXTERNAL URINARY SPINCTER

I:	The region designated as 'X' in the diagram is the sacral region of the spinal cord.
II:	Motor signals from the spinal cord lead to relaxation of the muscle in the wall of the urinary bladder and constriction of the urinary sphincter.

1.	Only I	2.	Only II
3.	Both I and II	4.	Neither I nor II

114 Consider the statements regarding the process of haemodialysis shown in the given figure:

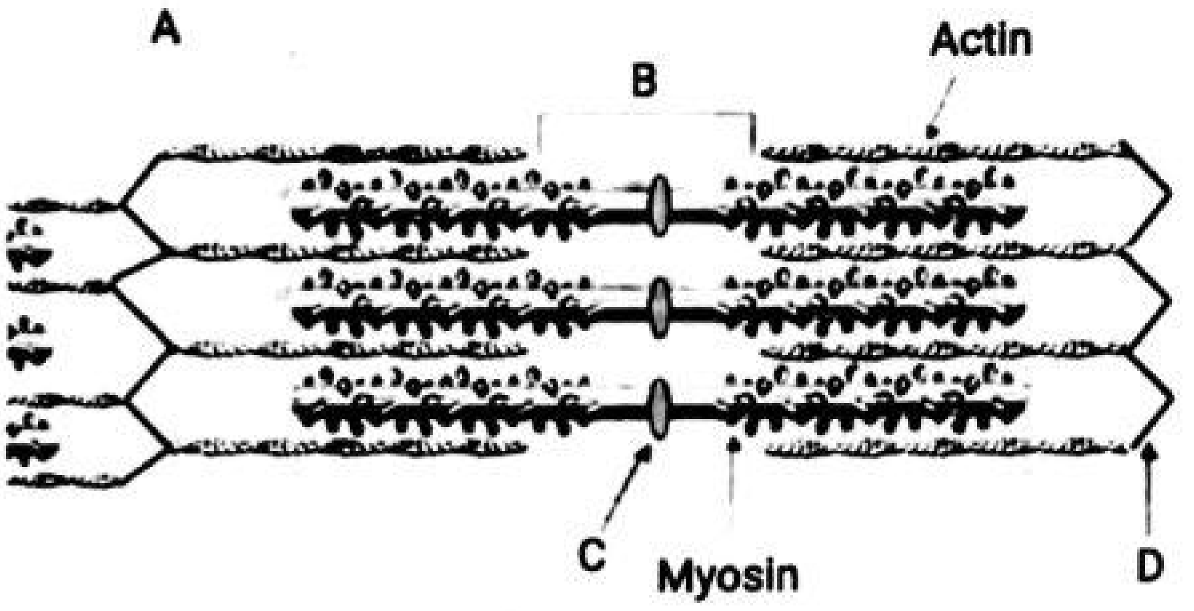

Dialyzer
Heparin pump
Air trap and Air detector
B
A
Blood pump

I:	A: the blood is taken out of the body from an artery for purification; B: the purified blood is returned to the body by a vein.
II:	Heparin is an anticoagulant that is added to the blood to prevent its coagulation; Dialyzer acts as the artificial kidney

1. Only I is correct
2. Only II is correct
3. Both I and II are correct
4. Both I and II are incorrect

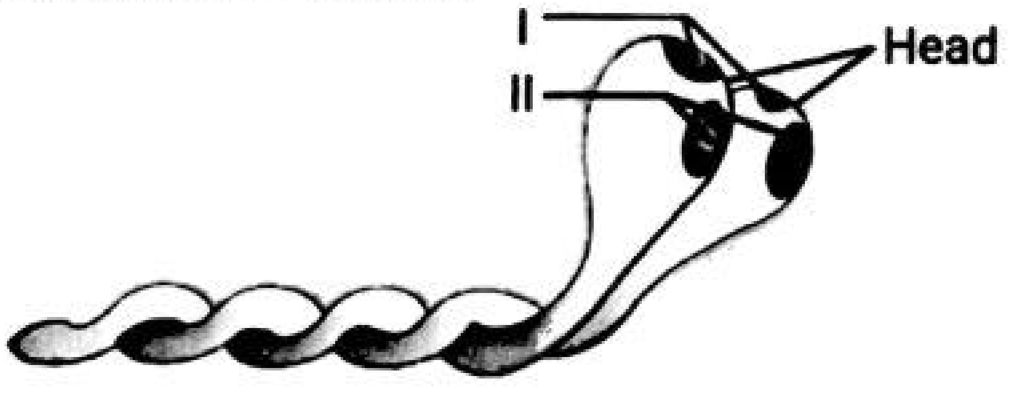
LOCOMOTION AND MOVEMENT

115 Select the correct match for the parts labeled as A, B, C and D in the given diagram of a sarcomere:



	A	B	C	D
1.	I band	A band	H zone	M line
2.	I band	H zone	M line	Z line
3.	A band	I band	Z line	M line
4.	H zone	I band	M line	Z line

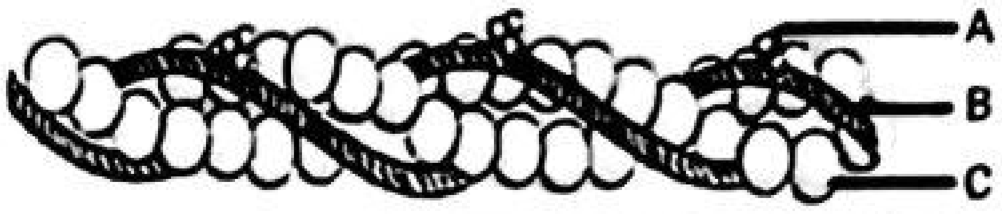
116 Identify the correct statements regarding the protein shown in the given diagram:



A: I is the active site to which the head of myosin binds during muscle contraction.
B: II is the site for ATP molecule.
C: The head shown has an ATPase activity.

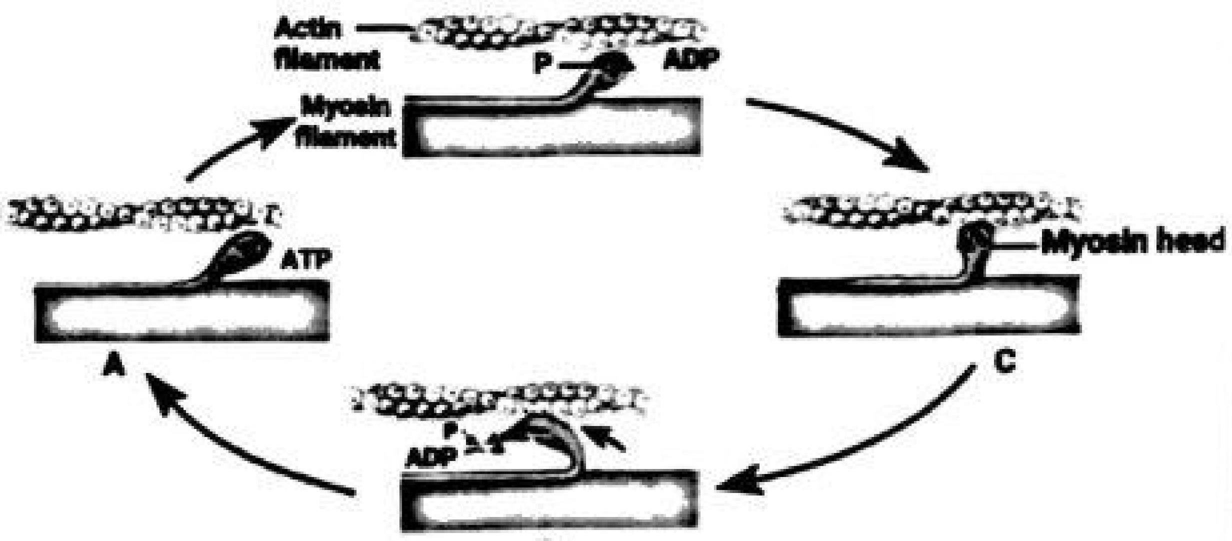
1. Only C	2. Only A
3. Only B and C	4. A, B and C

117 Identify the correct statement regarding the protein shown in the given figure:



1.	It makes up the I band of the sarcomere and A is Troponin, B is Tropomyosin and C is F-actin
2.	It makes up the A band of the sarcomere and A is Troponin, B is Tropomyosin and C is F-actin
3.	It makes up the I band of the sarcomere and A is Calmodulin, B is Tropomyosin and C is G-actin
4.	It makes up the A band of the sarcomere and A is Calmodulin, B is Tropomyosin and C is F-actin

118 The given figure shows stages in cross bridge formation, rotation of head and breaking of cross bridge during muscle contraction. Select the correct match for A, B and C from the codes given:



I. Sliding or rotation	A
II. Breaking of cross bridge	B
III. Formation of cross bridge	C

Codes:

	I	II	III
1.	B	A	C
2.	B	C	A
3.	A	B	C
4.	C	A	B

119 Study the events given below. Identify the set given in the choice that has the events in correct chronological order of their occurrence:

a. Ca^{2+} combines with tropomyosin
b. Ca^{2+} combines with troponin
c. tropomyosin pulls away from actin
d. troponin pulls away from actin
e. tropomyosin pulls away from myosin
f. troponin pulls away from myosin
g. myosin binds to actin

1.	a, d, g	2.	b, e, f
3.	a, c, g	4.	b, c, g

120 Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R):

Assertion (A):	Shortening of myofilaments leads to the shortening of the muscle.
Reason (R):	Only the actin myofilaments shorten while the length of the myosin myofilaments remains the same during the muscle shortening.

In the light of the above statements choose the correct answer from the options given below:

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	Both **(A)** and **(R)** are False.

121 Arrange the following events in correct chronological order:

a:	acetylcholine hydrolyses into acetate and choline
b:	acetylcholine diffuses across the synaptic cleft
c:	Impulse reaches the terminal endings of the motor neuron
d:	acetylcholine binds to its receptor on motor end plate
e:	sarcolemma gets depolarized

1.	b, c, d, a, e	2.	c, b, d, e, a
3.	c, d, b, a, e	4.	d, e, b, a, c

122 Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R):

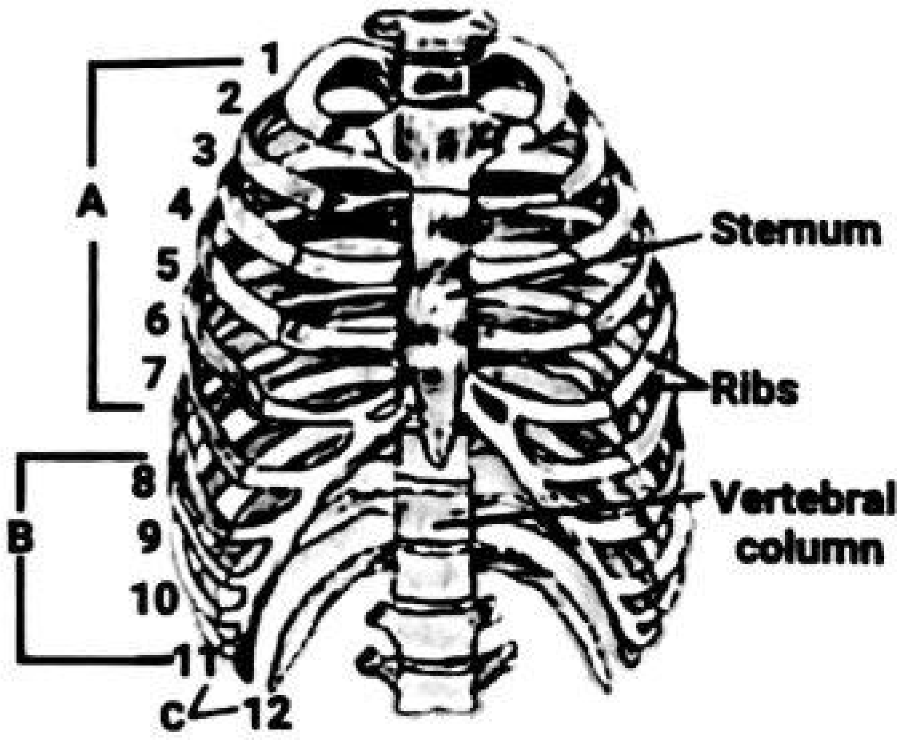
Assertion (A):	Slow twitch fibers can sustain action for a long period of time without fatigue.
Reason (R):	They can respire anaerobically by using a large store of glycogen and high concentration of glycolytic enzymes.

In the light of the above statements choose the correct answer from the options given below:

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	Both **(A)** and **(R)** are False.

123 The given figure shows the bones of the human rib cage. All the following statements will be correct regarding the human ribs except:

I:	Human ribs are dicondylic
II:	A represents the vertebra-sternal ribs
III:	B represents the vertebra-chondral ribs
IV:	C are the false ribs
V:	The costal cartilages shown are hyaline cartilages



1.	**Only I**	2.	**Only II, III and IV**
3.	**Only II and III**	4.	**Only I and IV**

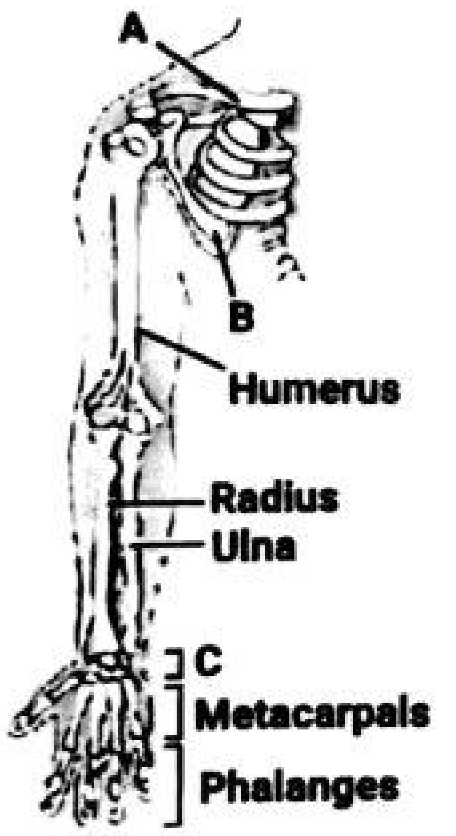
124 Match List-I with List-II :

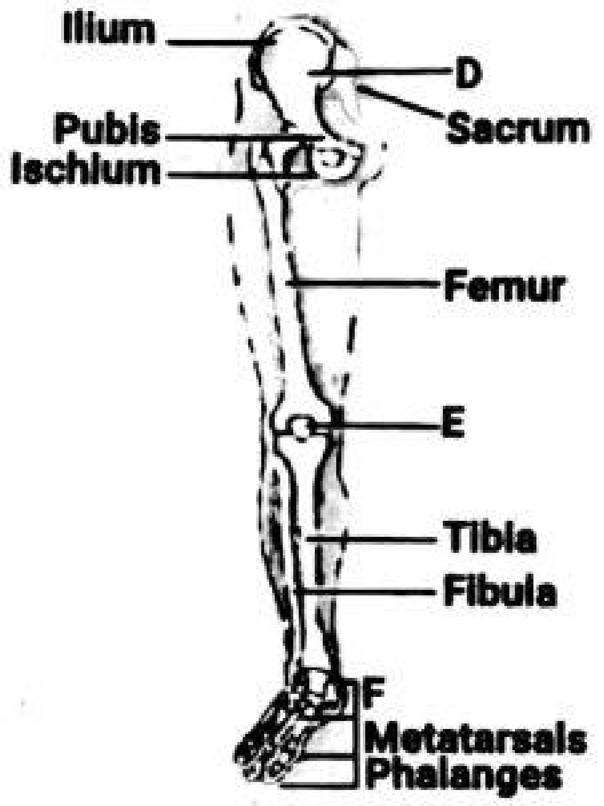
List-I	List-II
(a) Scapula	(i) Cartilaginous joints
(b) Cranium	(ii) Flat bone
(c) Sternum	(iii) Fibrous joints
(d) Vertebral column	(iv) Triangular flat bone

Choose the correct answer from the options given below.

	(a)	(b)	(c)	(d)
1.	(iv)	(ii)	(iii)	(i)
2.	(iv)	(iii)	(ii)	(i)
3.	(i)	(iii)	(ii)	(iv)
4.	(ii)	(iii)	(iv)	(i)

125 Identify the correct statements regarding the given two figures:


A
B
Humerus
Radius
Ulna
C
Metacarpals
Phalanges


Ilium
D
Sacrum
Pubis
Ischium
Femur
E
Tibia
Fibula
F
Metatarsals
Phalanges

I:	A is a part of the pectoral girdle and is commonly called as the collar bone.
II:	B is the scapula, a part of the pectoral girdle, which directly articulates with the breast bone, sternum.
III:	C represents carpal bones and the type of synovial joint seen between them is the saddle joint.
IV:	D is the coxal bone and three such bones fuse to form the pelvic girdle.
V:	
VI:	

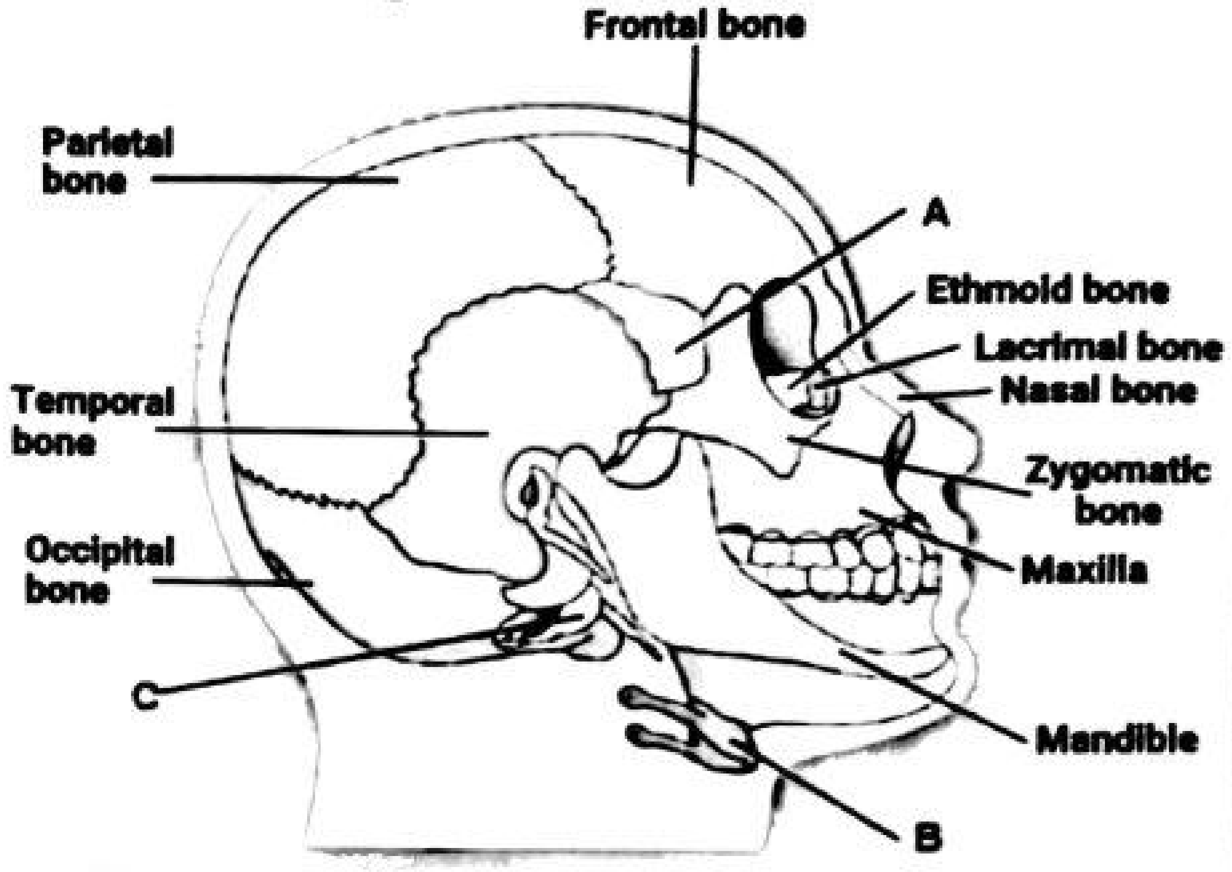
1.	I and V only	2.	I, V and VI only
3.	II, III and IV only	4.	II, IV and VI only

126 Classification of joints is done on the basis of:

I:	the connective tissue that binds the bones together
II:	the degree of motion at each joint
III:	the number of bones that articulate with each other
IV:	the embryonic tissue that formed the joint

1.	I, II and III	2.	II and III
3.	I, II, III and IV	4.	I and II

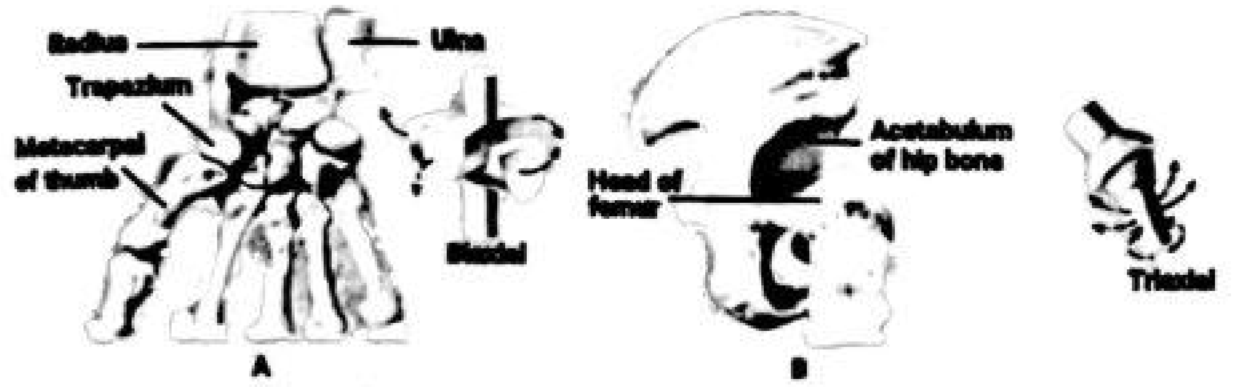
127 Identify the correct statements regarding the parts labelled as A, B and C in the given diagram of the bones of the human skull region:


Frontal bone
Parietal bone
A
Ethmoid bone
Lacrimal bone
Nasal bone
Temporal bone
Zygomatic bone
Occipital bone
Maxilla
C
Mandible
B

I:	The bone A has a saddle like depression where the pituitary gland is located inside the cranium.
II:	The bone B provides attachment to tongue and does not articulate with any other bone in our body.
III:	The structure C is a part of the occipital bone of the cranium and our skull has two such structures.

1.	Only I and II	2.	Only I and III
3.	Only II and III	4.	I, II and III

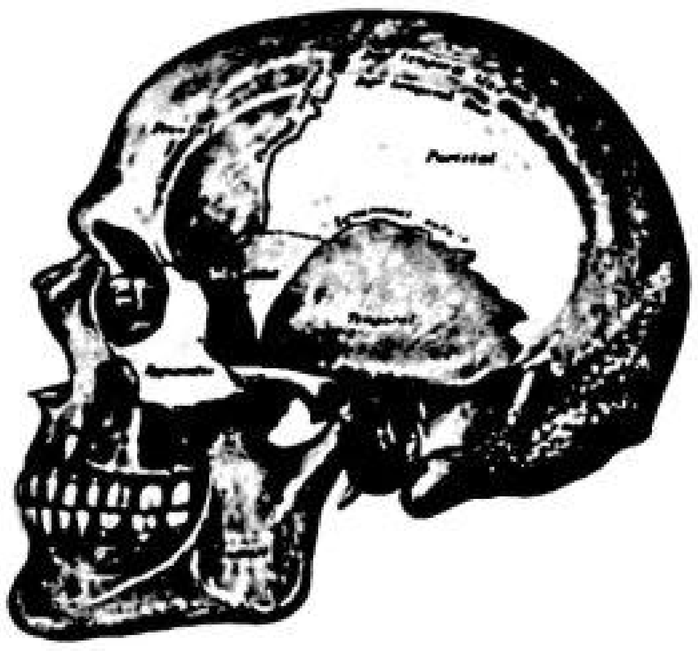
128 Given below are two figures, A and B, showing two important synovial joints in human body. What will be correct?



I:	The joint in figure A is called as the saddle joint.
II:	The joint in figure B is the largest ball and socket joint in human body.

1.	Only I	2.	Only II
3.	Both I and II	4.	Neither I nor II

129 The joints seen between the bones of cranium [look at the given figure] are:

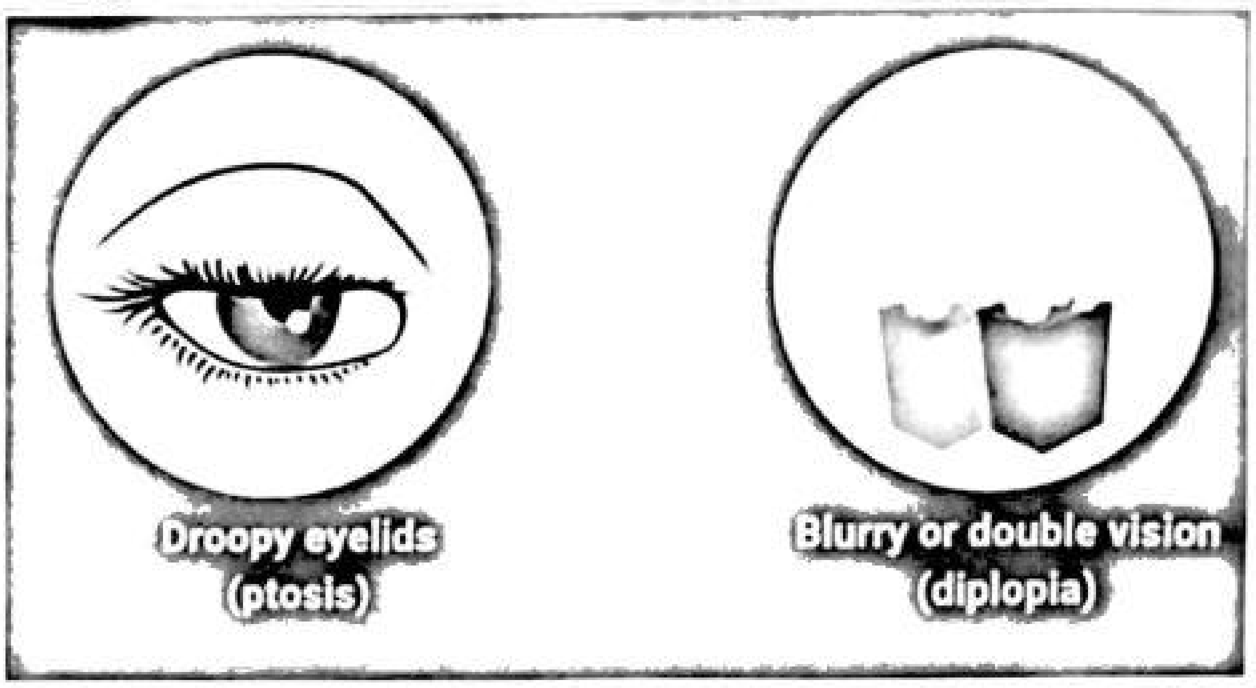


1.	fibrous joints called as sutures that do not allow any mobility.
2.	cartilaginous syndesmoses that allow limited mobility.
3.	synovial joints where the elatin protein connects the two articulating bones and allow free movements.
4.	fibrous joints called as gomphosis.

130 Situated between the two hip bones of the pelvis, sacrum is a triangular bone in the lower back formed from fusion of:

1.	3 vertebrae	2.	5 vertebrae
3.	7 vertebrae	4.	12 vertebrae

131 The given figure shows important signs and symptoms of an auto-immune disorder affecting neuro-muscular junction leading to fatigue, weakening and paralysis of skeletal muscle apart from the one shown in the figure. This disease is:



1.	Multiple sclerosis	2.	Rheumatoid arthritis
3.	Muscular dystrophy	4.	Myasthenia gravis

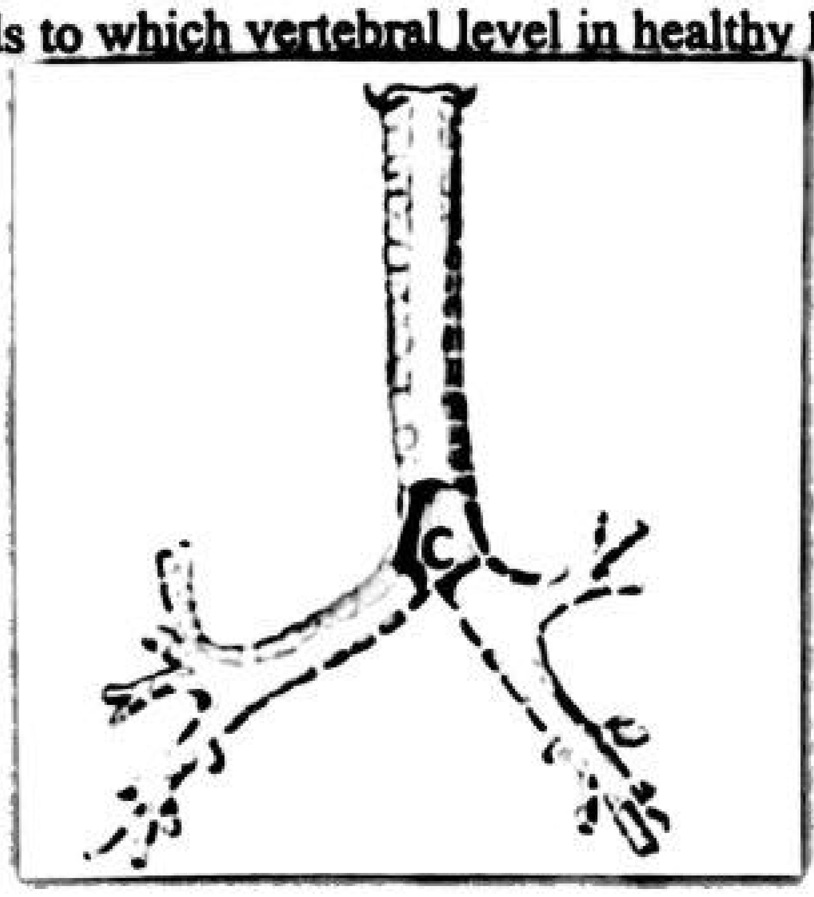
132 Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R):

Assertion (A):	Hypocalcemia is the primary cause of tetany.
Reason (R):	Hypocalcemia increases neuronal excitability

In the light of the above statements choose the correct answer from the options given below:

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	Both **(A)** and **(R)** are False.

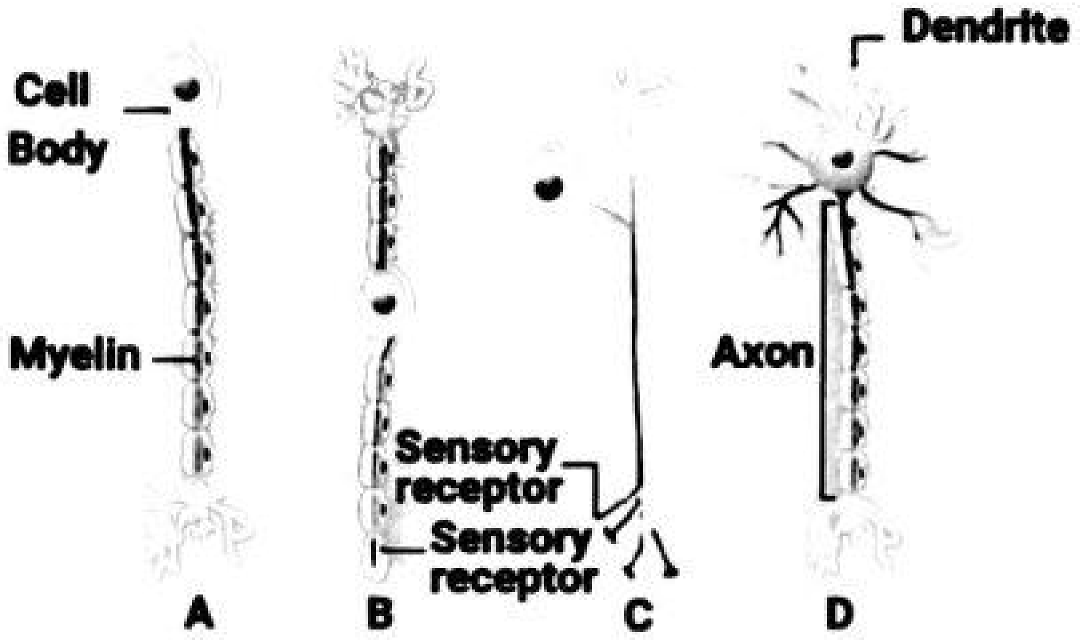
133 The point 'C' marked in the given diagram corresponds to which vertebral level in healthy humans?



1. Seventh cervical
2. Second thoracic
3. Fifth thoracic
4. Second lumbar

NEURAL CONTROL AND COORDINATION

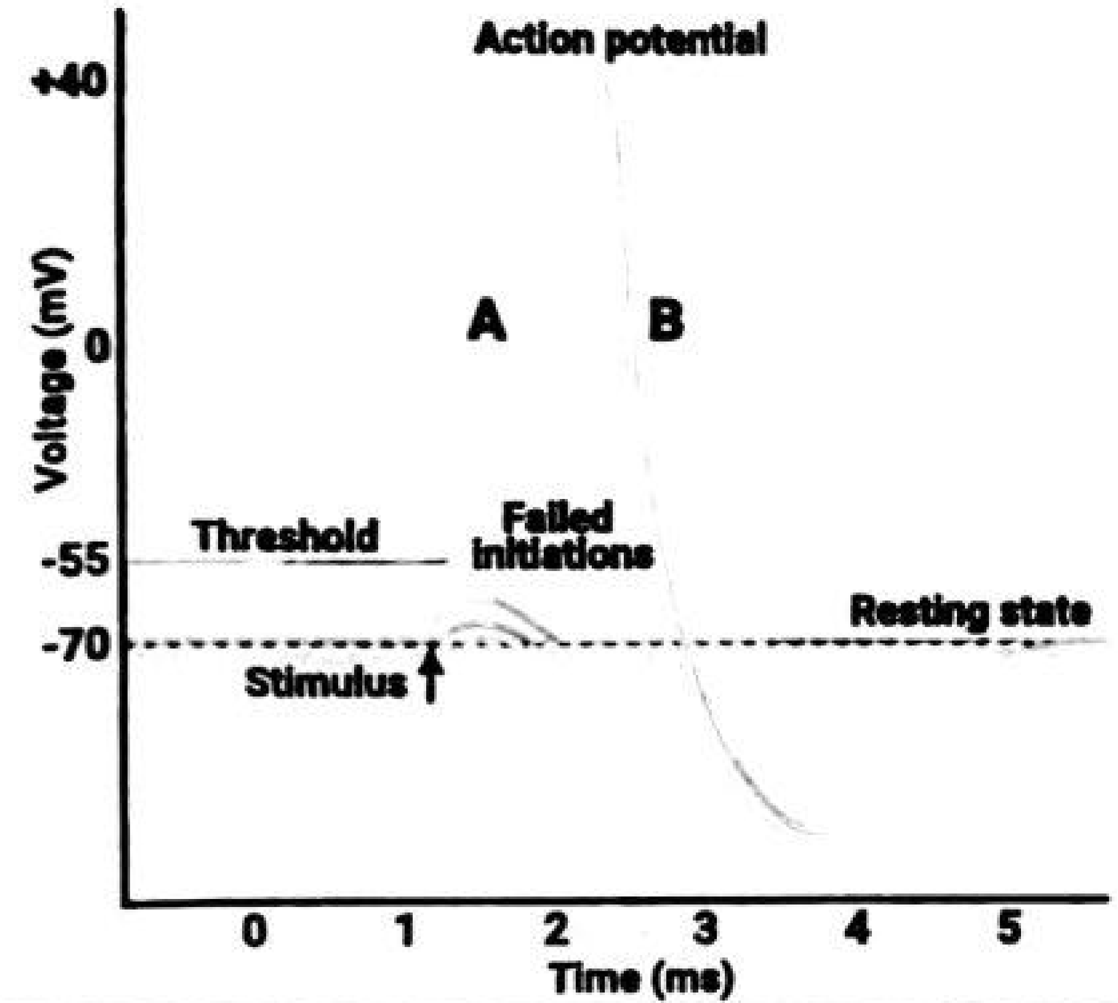
134 Given figure shows the types of neurons found in human body. Identify the correct match for their location in the body from the options given:


Dendrite
Cell Body
Myelin
Axon
Sensory receptor
Sensory receptor
A
B
C
D

I: Embryonic stages
II: Retina
III: Dorsal root ganglion of spinal nerve
IV: Cerebral cortex
V: Olfactory membrane

	A	B	C	D
1.	I	II	III	IV
2.	II	V	I	III
3.	I	III	II	IV
4.	III	IV	II	I

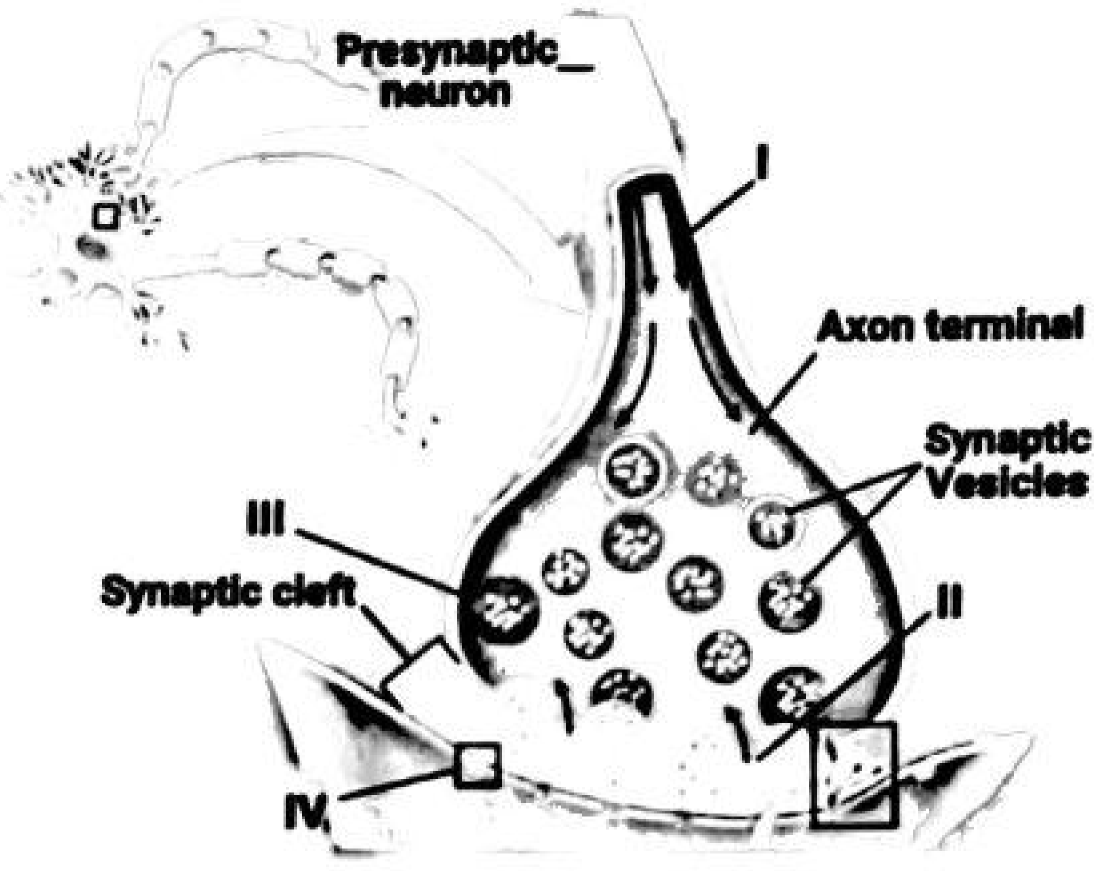
135 Identify the correct statements regarding the events A and B in the given diagram:



I:	A is depolarization and is caused by the influx of sodium ions.
II:	B is repolarization and is caused by the efflux of potassium ions.

1. Only I
2. Only II
3. Both I and II
4. Neither I nor II

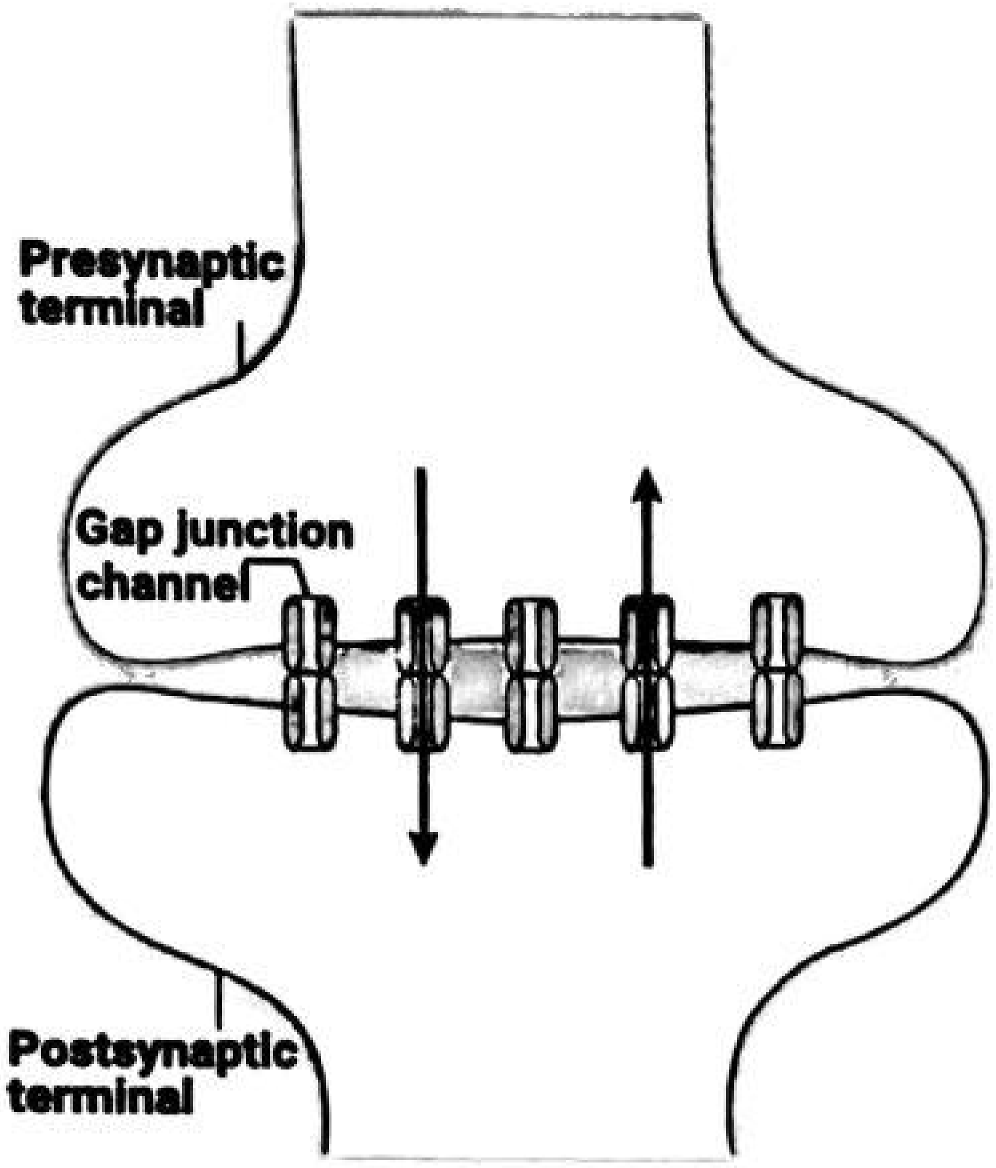
136 Identify the correct statements regarding the sequence of events taking place during transmission of impulse across a chemical synapse as shown in the given figure:



I:	The action potential, generated due to the depolarization of the axonal membrane, arrives at the axon terminal.
II:	Potassium ions enter the synaptic knob.
III:	Synaptic vesicles are activated and release neurotransmitter in the synaptic cleft.
IV:	Neurotransmitter binds to the receptor on the post-synaptic membrane.

1. Only I, II and III
2. Only I, III and IV
3. Only II, III and IV
4. I, II, III and IV

137 What would be true regarding the structure shown in the given figure?



1.	It is a chemical synapse and there is unidirectional transmission of impulse across it.
2.	It is a chemical synapse and a chemical neurotransmitter is involved in the transmission of impulse across it.
3.	It is an electrical synapse and it is relatively slower than the chemical synapse.
4.	It is an electrical synapse, and although faster than the chemical synapse, is rare in human body.

138 Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R):

Assertion (A):	The resting membrane potential in a neuron is much closer to the equilibrium potential of K^+ ions than it is to equilibrium potential of Na^+ ions.
Reason (R):	While potassium is the principal cation in the intracellular fluid, sodium is the principal cation in the extracellular fluid.

In the light of the above statements choose the correct answer from the options given below:

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	Both **(A)** and **(R)** are False.

139 Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R):

Assertion (A):	Once initiated, the action potential has a magnitude that is independent of the strength of the triggering stimulus.
Reason (R):	Action potentials are all or none responses to stimuli.

In the light of the above statements choose the correct answer from the options given below:

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	Both **(A)** and **(R)** are False.

FAT MCQs (UNIT - IV & V)

140 Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R):

Assertion (A):	The same neurotransmitter, acetylcholine, may be inhibitory at some places like heart and excitatory elsewhere like alimentary canal.
Reason (R):	The cells involved in each case have different receptors for ACh that produce different effects.

In the light of the above statements choose the correct answer from the options given below:

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	Both **(A)** and **(R)** are False.

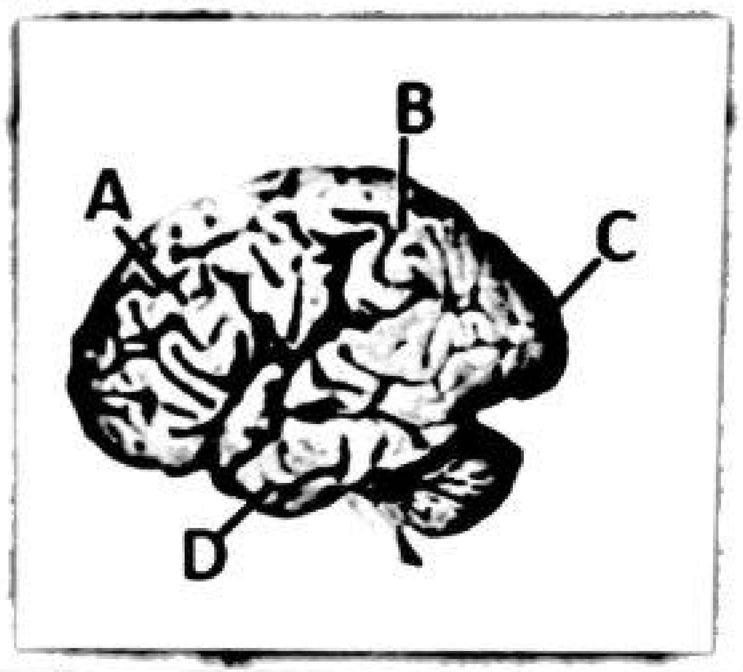
141 Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R):

Assertion (A):	Action potential propagation in unmyelinated neurons is faster than in myelinated neurons.
Reason (R):	Myelin is a complex polysaccharide and it slows the conduction of the impulse along the axonal membrane.

In the light of the above statements choose the correct answer from the options given below:

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	Both **(A)** and **(R)** are False.

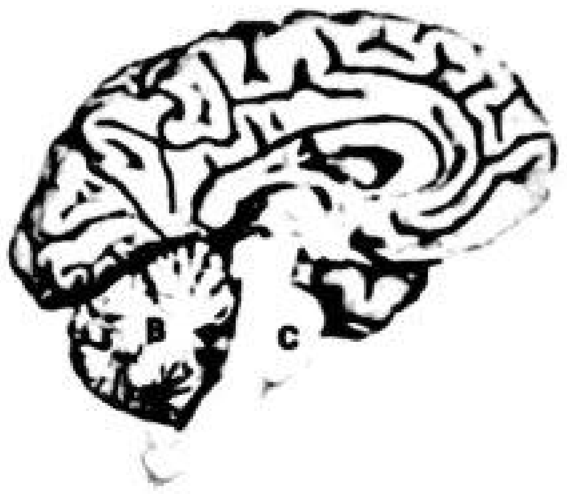
142 Identify the correct match for the lobes of cerebrum shown in the given figure:



A:	Frontal lobe	Planning, reasoning and problem solving
B:	Parietal lobe	Integrating sensory information, including touch, temperature, pressure and pain
C:	Occipital lobe	Location of the primary visual cortex which receives visual information from the eyes
D:	Temporal lobe	Contains the primary auditory cortex, which receives auditory information from the ears

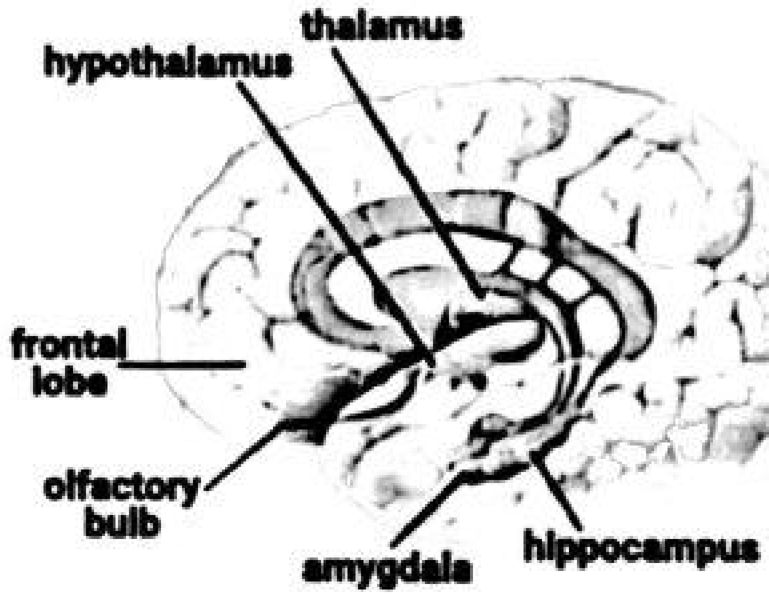
1.	Only **A** and **B**	2.	Only **A, B** and **C**
3.	Only **B, C** and **D**	4.	**A, B, C** and **D**

143 Identify A, B and C in the sagittal section of the human brain:



	A	B	C
1.	Corpus callosum	Cerebellum	Pons
2.	Cerebellar peduncle	Cerebrum	Medulla
3.	Corpus callosum	Cerebrum	Pons
4.	Corpus luteum	Cerebellum	Medulla

144 The structure highlighted in orange colour in the figure is:


thalamus
hypothalamus
frontal lobe
olfactory bulb
amygdala
hippocampus

1.	Diencepahlon and is the location of the third ventricle.
2.	Corpora quadrigemina and the cerebral aqueduct passes through it.
3.	Limbic system and regulates the behaviour in humans.
4.	Reticular formation and is the gate keeper to consciousness.

145 Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R):

Assertion (A):	Damage to cerebellum may cause ataxia and dysarthria.
Reason (R):	The cerebellum plays an important role in motor control.

In the light of the above statements choose the correct answer from the options given below:

1.	Both (A) and (R) are True and (R) is the correct explanation of (A).
2.	Both (A) and (R) are True but (R) is not the correct explanation of (A).
3.	(A) is True but (R) is False.
4.	Both (A) and (R) are False.

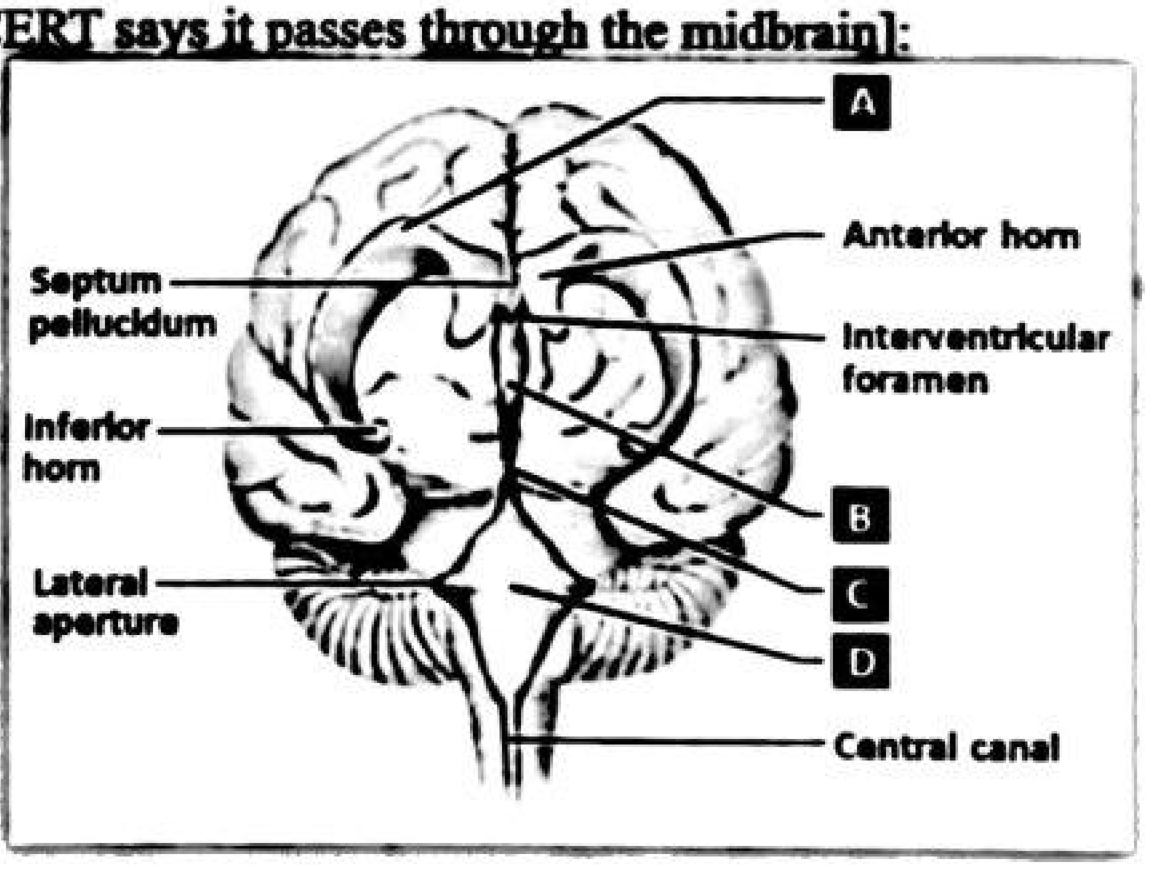
146 Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R):

Assertion (A):	People with extensive, bilateral hippocampal damage may experience anterograde amnesia (the inability to form and retain new memories).
Reason (R):	The hippocampus belongs to the limbic system and plays important roles in the consolidation of information from short-term memory to long-term memory.

In the light of the above statements choose the correct answer from the options given below:

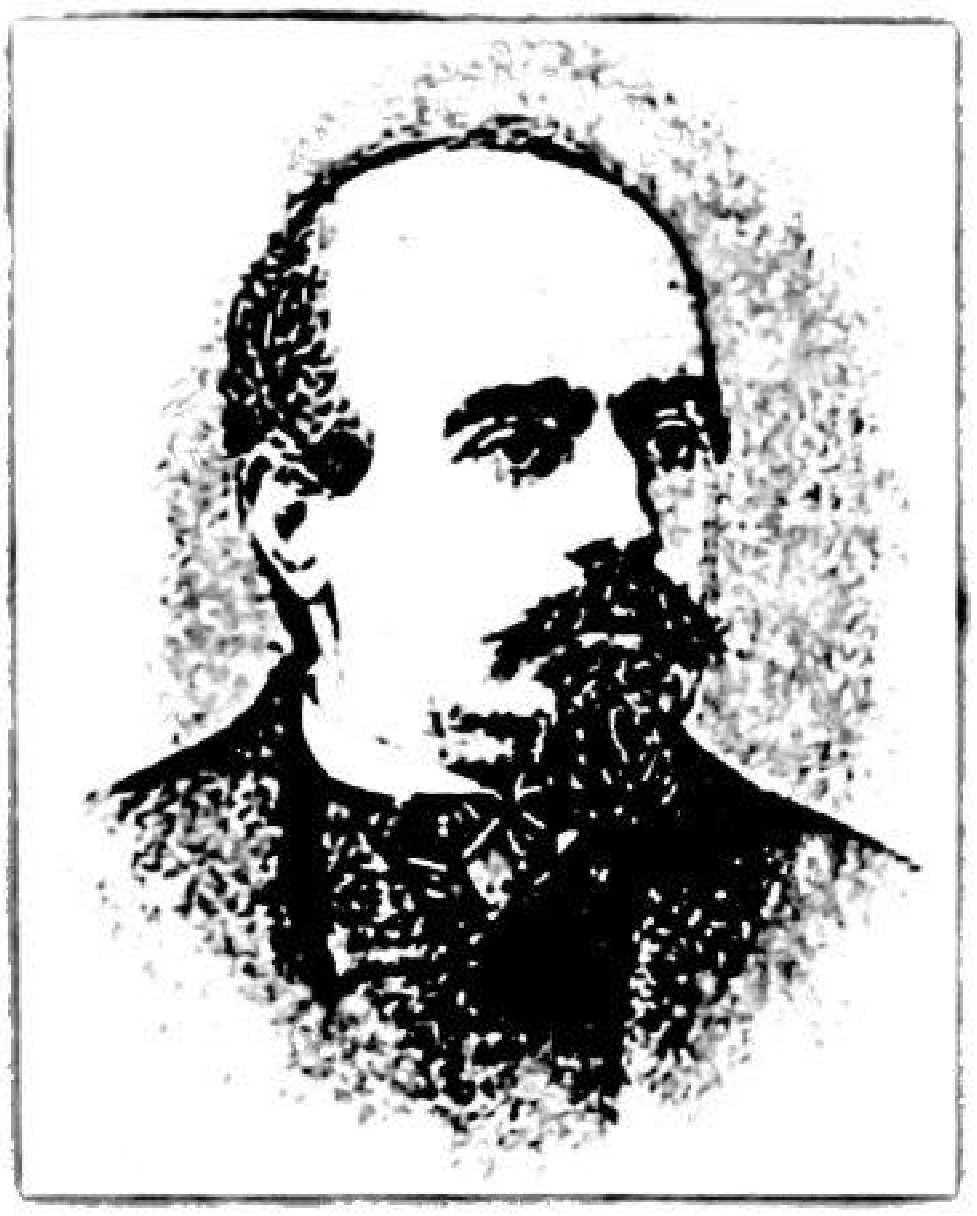
1.	Both (A) and (R) are True and (R) is the correct explanation of (A).
2.	Both (A) and (R) are True but (R) is not the correct explanation of (A).
3.	(A) is True but (R) is False.
4.	Both (A) and (R) are False.

147 In the diagram, identify the cerebral aqueduct [Hint: NCERT says it passes through the midbrain]:


A
Anterior horn
Septum pellucidum
Interventricular foramen
Inferior horn
B
Lateral aperture
C
D
Central canal

1. A
2. B
3. C
4. D

148 Identify the scientist:

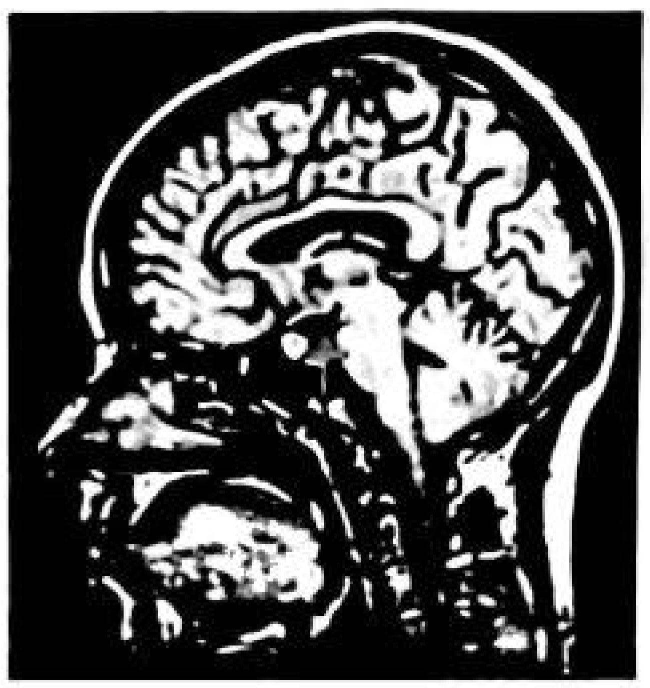


I:	He was originally studying medicine but switched to zoology and anatomy because of his fascination with the structure of organisms.
II:	His meticulous work on the anatomy of the ear, conducted without the advanced tools we have today, demonstrates the power of careful observation and dedication.

1. Alfonso Corti
2. Lazzaro Spallanzani
3. George Palade
4. Andreas Vesalius

CHEMICAL COORDINATION AND INTEGRATION

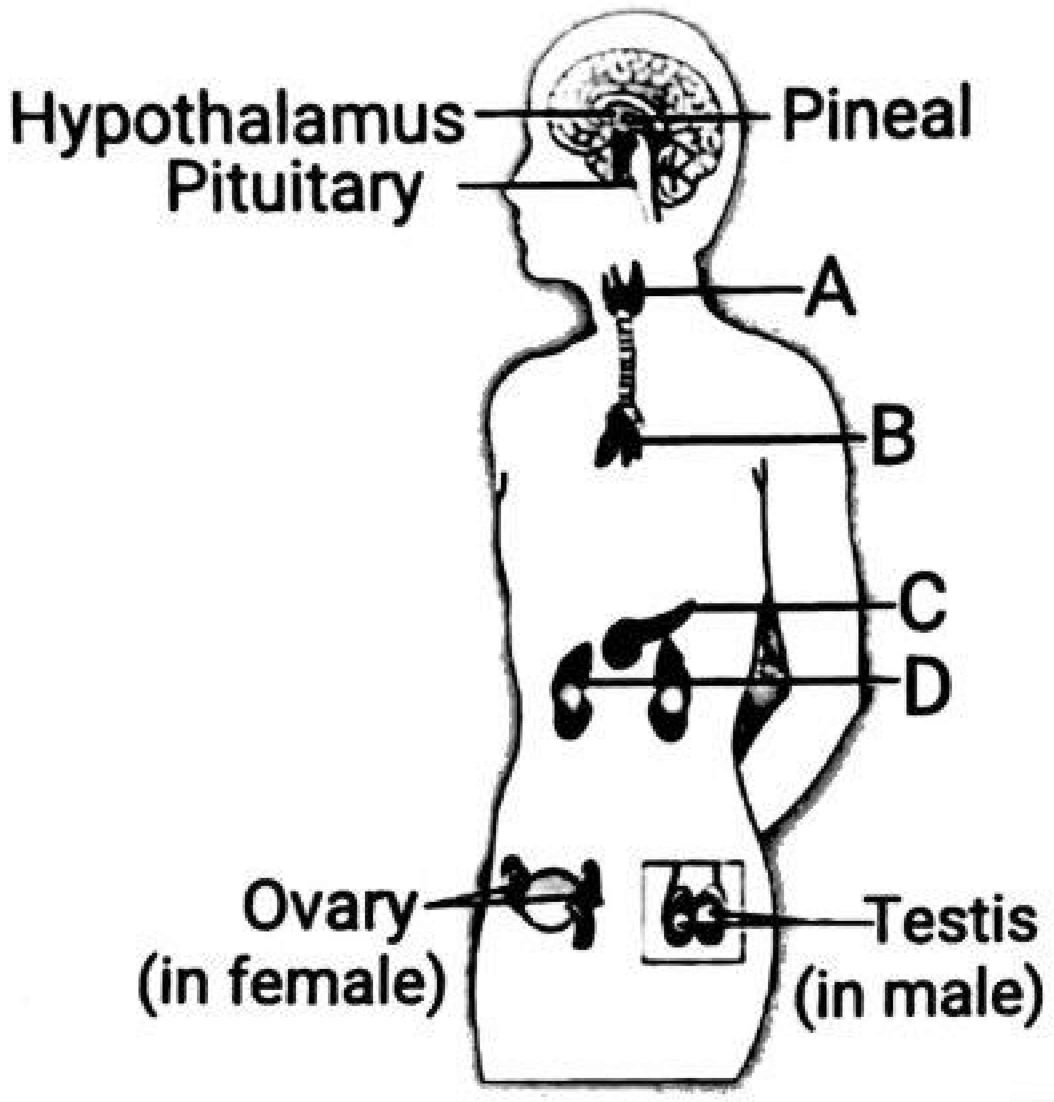
149



The arrow shows an area of the brain with a number of important functions including linking the nervous system to the endocrine system via the pituitary gland. This area must be:

1. Hypophysis	2. Hypothalamus
3. Corpora quadrigemina	4. Mammillary body

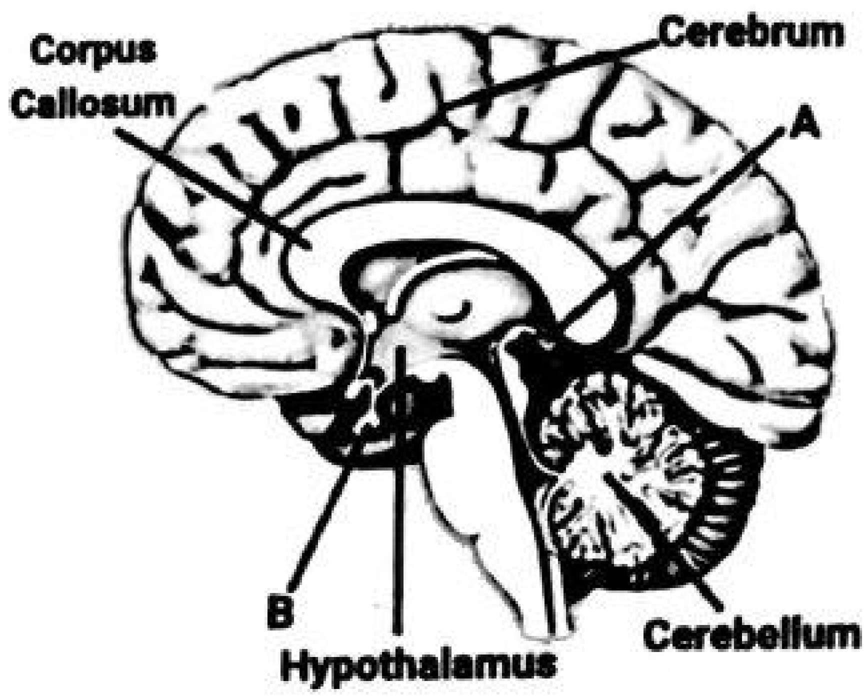
150 What will be true for A, B, C and D as shown in the given figure?


Hypothalamus
Pituitary
Pineal
A
B
C
D
Ovary (in female)
Testis (in male)

I:	The glands located in the region A play a very important role in calcium homeostasis.
II:	The gland B increases in size from puberty to adulthood and then decreases in size in old age.
III:	C is both an endocrine and an exocrine gland.
IV:	D is kidney and does not produce any hormone.

1. I and III only
2. II and IV only
3. I, II and III only
4. II, III and IV only

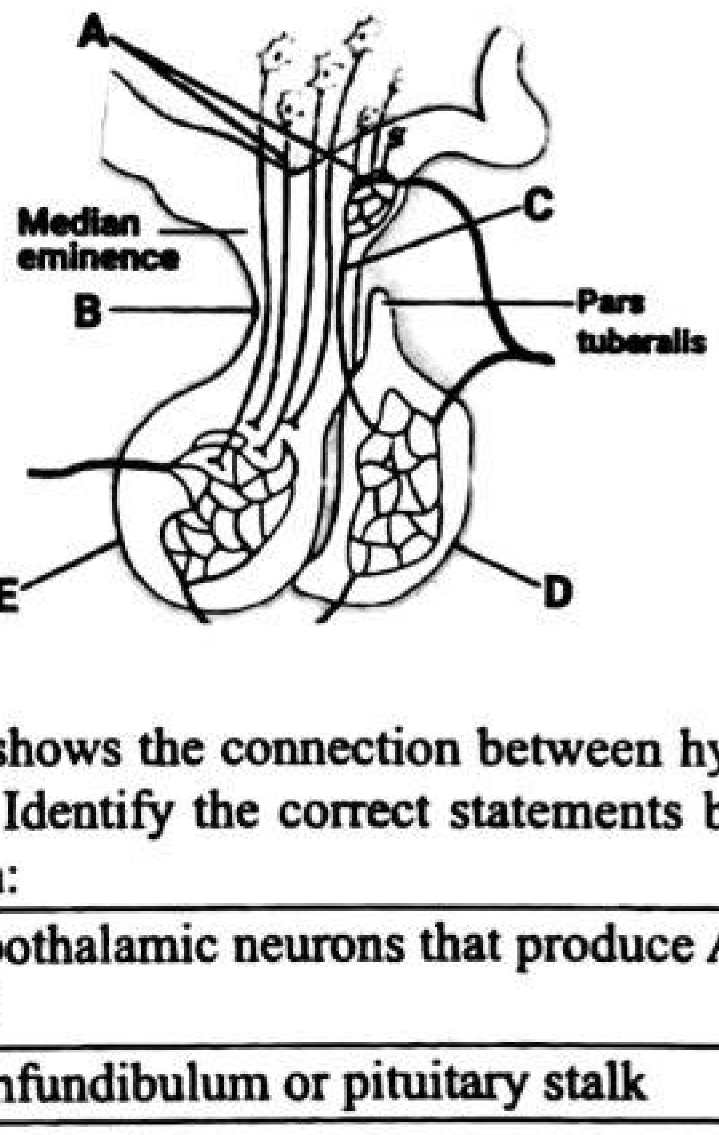
151


Corpus Callosum
Cerebrum
A
B
Hypothalamus
Cerebellum

In the given diagram, A and B respectively are:

	A	B
1.	Anterior pituitary	Posterior pituitary
2.	Superior colliculus	Inferior colliculus
3.	Pineal gland	Pituitary gland
4.	Broca's area	Sella turcica

152

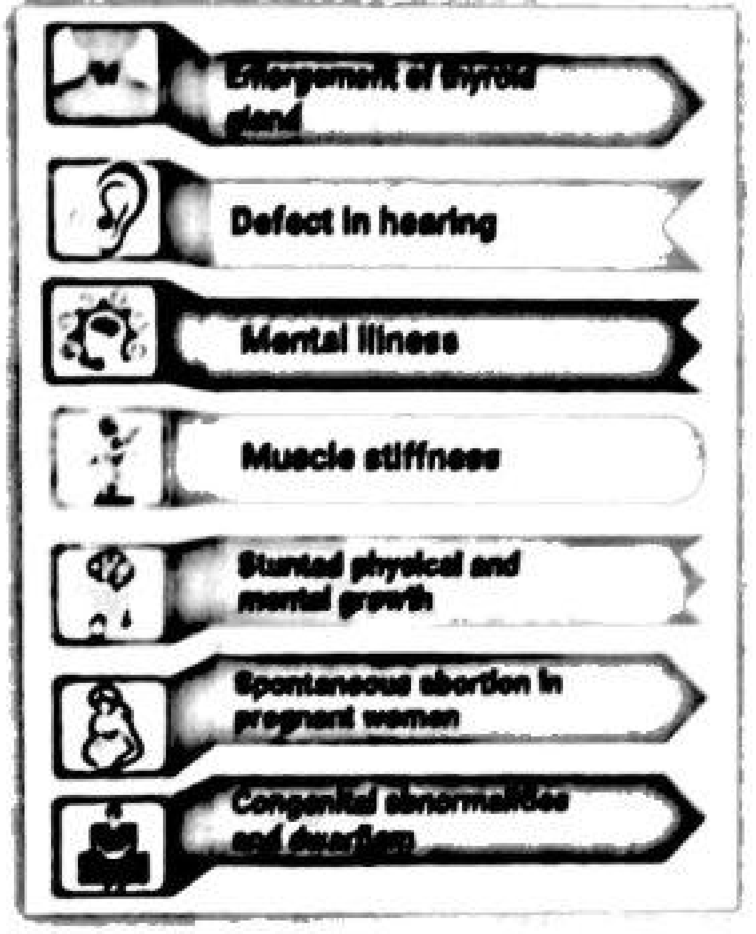

A
Median eminence
B
C
Pars tuberalis
E
D

The diagram shows the connection between hypothalamus and pituitary. Identify the correct statements based on the given diagram:

I:	A are hypothalamic neurons that produce ADH and Oxytocin
II:	B is the infundibulum or pituitary stalk
III:	C is a portal vein
IV:	D is pars distalis
V	E is pars nervosa

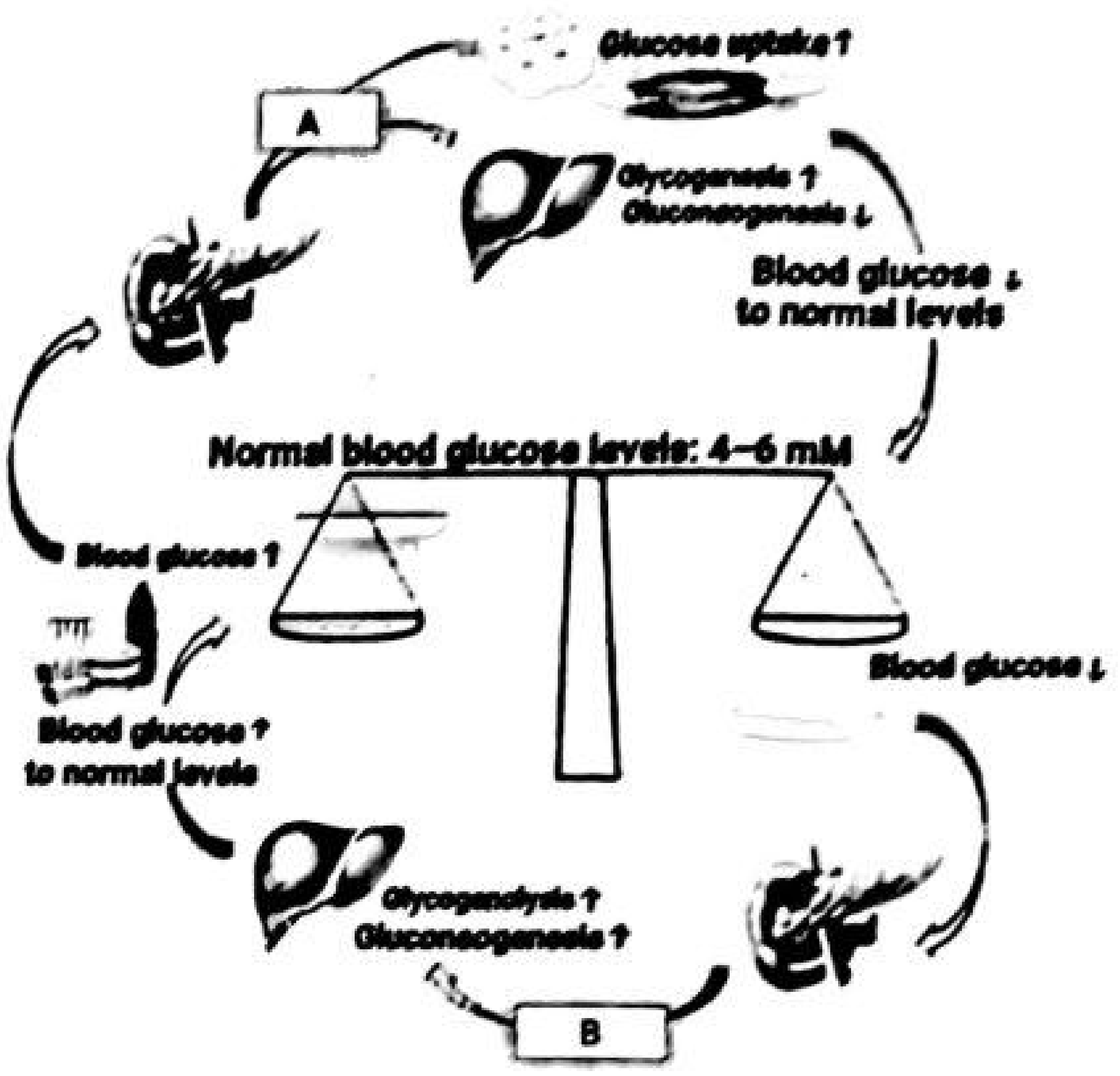
1.	I and II only	2.	I, II and III only
3.	I and III only	4.	II and III only

153 The sign and symptoms enlisted in the given figure are most likely to be caused by the deficiency of:


Enlargement of thyroid gland
Defect in hearing
Mental illness
Muscle stiffness
Stunted physical and mental growth
Spontaneous abortion in pregnant women
Congenital abnormalities and dwarfism

1.	Calcium	2.	Iron
3.	Iodine	4.	Zinc

154

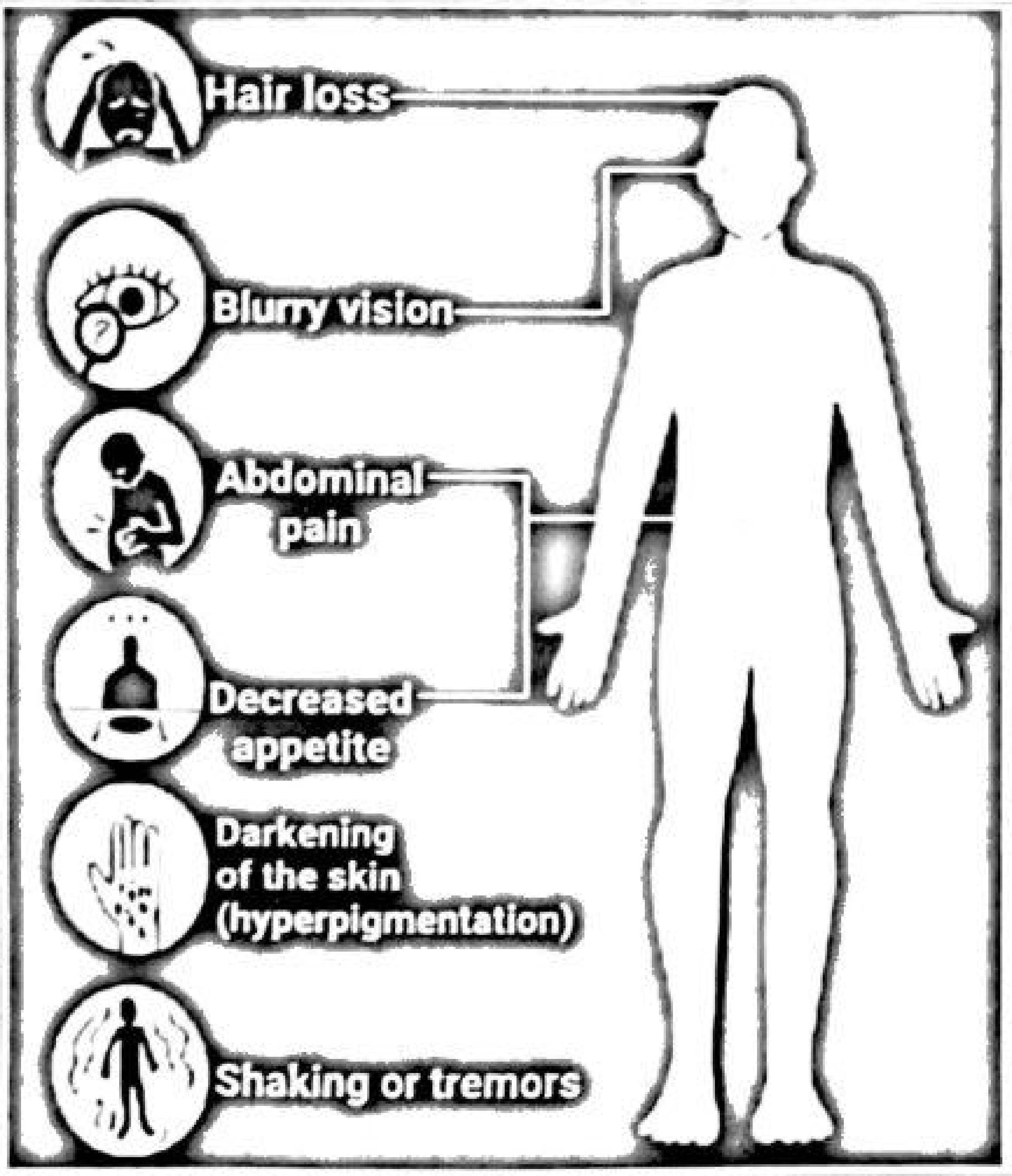

Glucose uptake ↑
A
Glycogenesis ↑
Gluconeogenesis ↓
Blood glucose ↓
to normal levels
Normal blood glucose levels: 4–6 mM
Blood glucose ↑
Blood glucose ↑
to normal levels
Blood glucose ↓
Glycogenolysis ↑
Gluconeogenesis ↑
B

The given diagram shows glucose homeostasis in humans.

I:	A is insulin and B is glucagon
II:	A is a peptide hormone and B is a steroid
III:	A is a hypoglycaemic hormone and B is a hyperglycaemic hormone

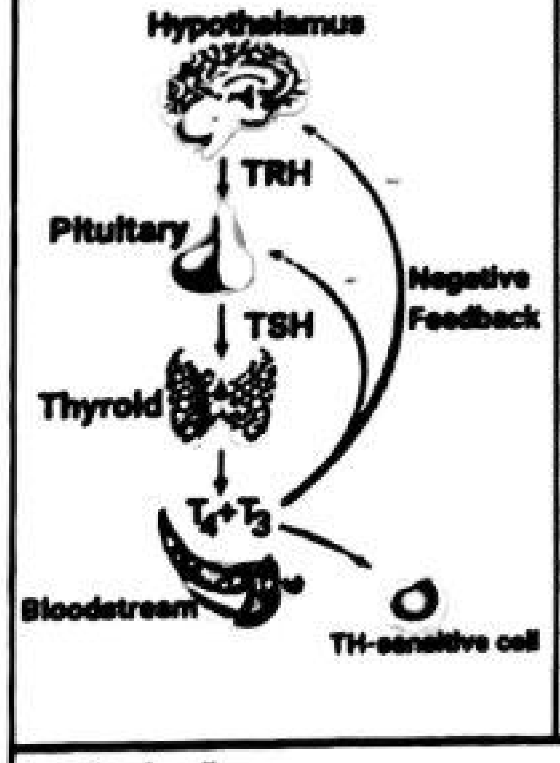
1.	Only I is correct	2.	Only I and III are correct
3.	Only II is correct	4.	I, II and III are correct

155 Study the given figure carefully. The constellation of symptoms shown in the figure is caused by an overall decreased functioning of the adrenal cortex. This disease is called as:


Hair loss
Blurry vision
Abdominal pain
Decreased appetite
Darkening of the skin (hyperpigmentation)
Shaking or tremors

1. Addison's disease	2. Hashimoto's disease
3. Gull's disease	4. Conn's syndrome

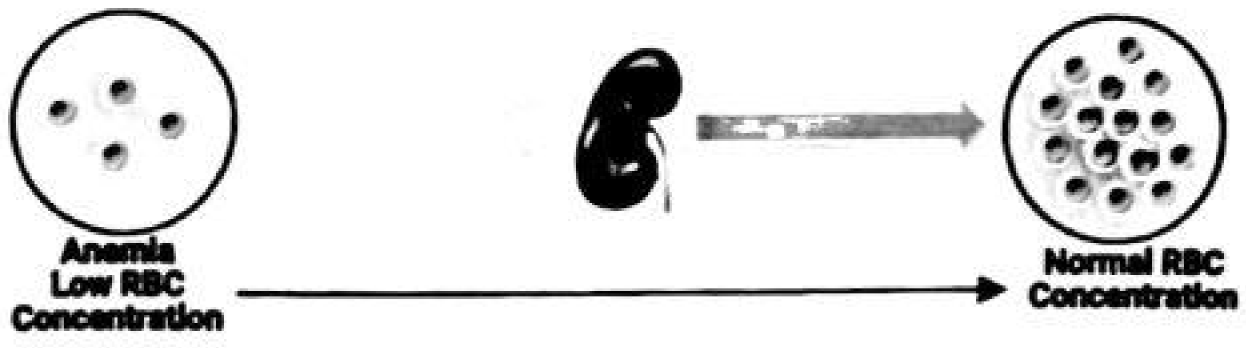
156 The diagram shows Hypothalamus – Pituitary – Thyroid axis. Based on the diagram, what will be true?

	I. Under normal physiological conditions, a decrease in the levels of thyroid hormones in the blood will lead to an increase in the secretion of TRH by Hypothalamus. II. Under normal physiological conditions, a decrease in the levels of thyroid hormones in the blood will lead to a decrease in the secretion of TSH by Anterior pituitary.

Hypothalamus
TRH
Pituitary
TSH
Negative Feedback
Thyroid
T_4+T_3
Bloodstream
TH-sensitive cell

1. Only I	2. Only II
3. Both I and II	4. Neither I nor II

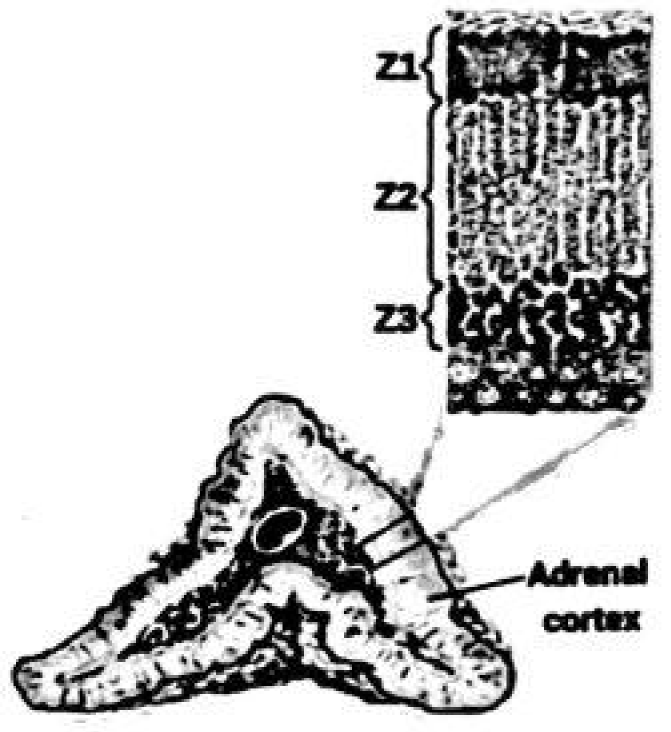
157 The hormone involved in the response shown in the given figure:


Anemia
Low RBC Concentration
Normal RBC Concentration

I. is a peptide hormone.
II. is secreted by the kidneys.
III. helps the body absorb vitamin B 12 in the small intestine.

1. Only I and II are correct
2. Only I and III are correct
3. Only II and III are correct
4. I, II and III are correct

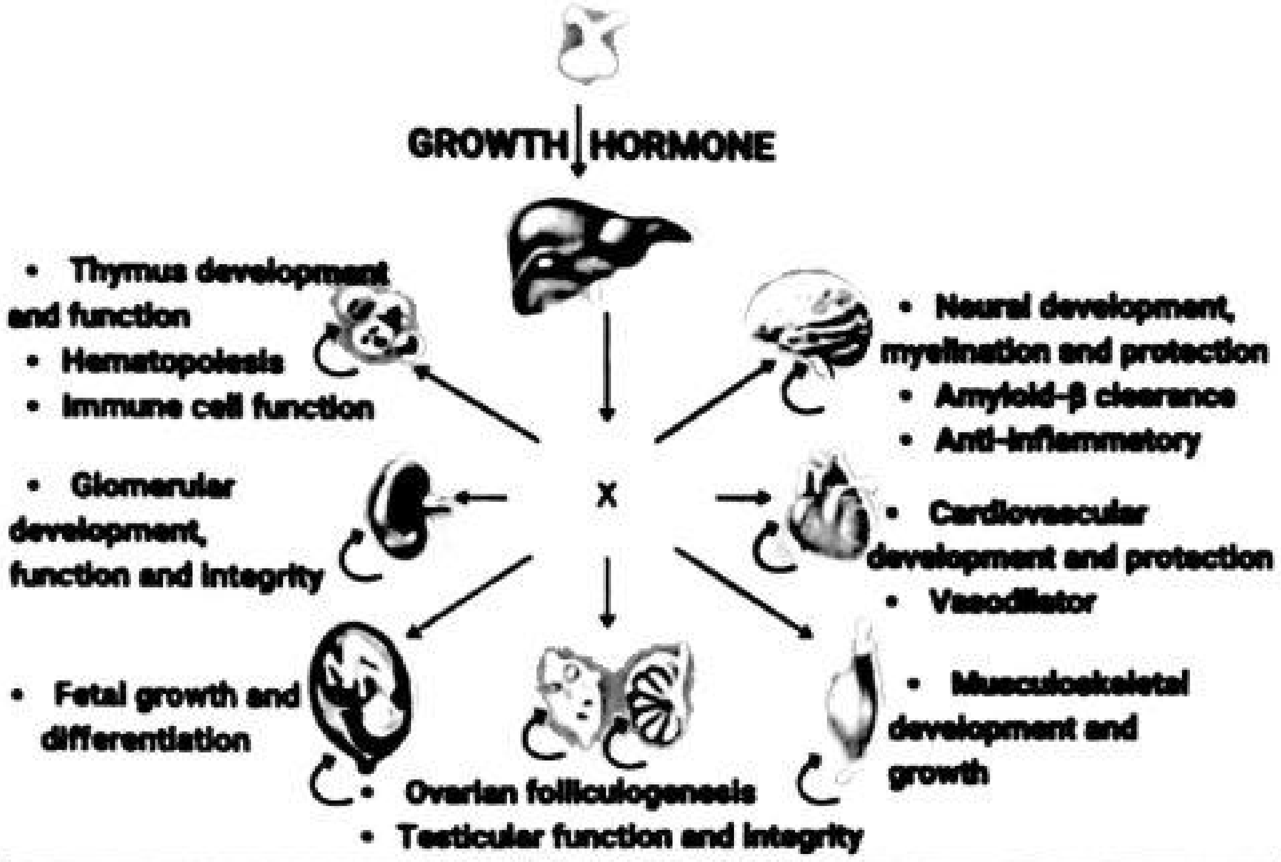
158 What would be true for Z1, Z2 and Z3 as shown in the given diagram?


Z1
Z2
Z3
Adrenal cortex

I. Z1 is functionally related to sympathetic neural system.
II. Only the hormones secreted by Z2 are steroids.
III. The hormone secreted by Z3 is an androgen.
IV. The hormone secreted by Z1 mainly affects the carbohydrate, lipid and fat metabolism and is a potent anti-inflammatory agent.
V. All hormones produced by Z1, Z2 and Z3 act through a second messenger on their target cells.

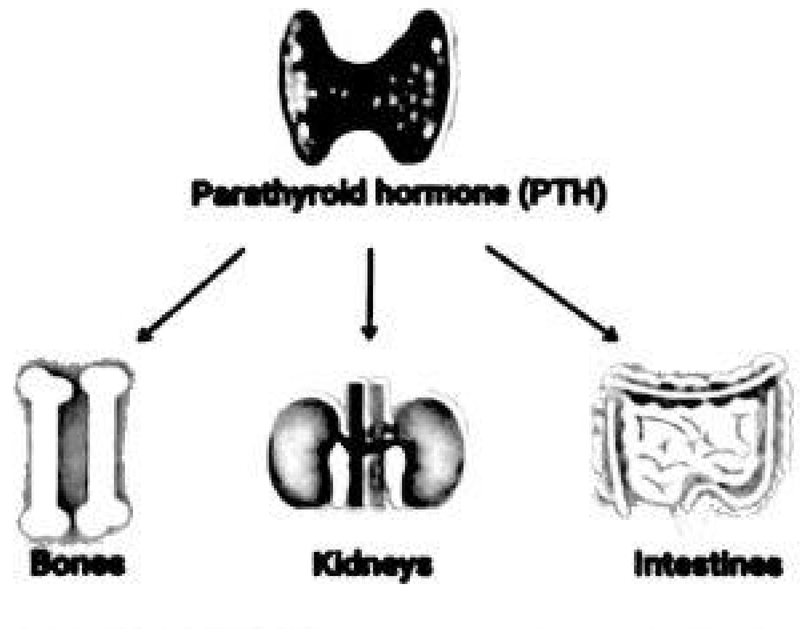
1.	Only IV	2.	Only IV and V
3.	Only III	4.	I, II and III

159 The given figure shows the mechanism of action of growth hormone on target cells which involves the secretion of X by liver when stimulated by the growth hormone. X is:


GROWTH HORMONE
X
• Thymus development and function
• Hematopoiesis
• Immune cell function
• Neural development, myelination and protection
• Amyloid-β clearance
• Anti-inflammatory
• Glomerular development, function and integrity
• Cardiovascular development and protection
• Vasodilator
• Fetal growth and differentiation
• Ovarian folliculogenesis
• Testicular function and integrity
• Musculoskeletal development and growth

1.	Somatostatin	2.	Somatotropin
3.	Insulin like Growth Factor	4.	Somatomammotropin

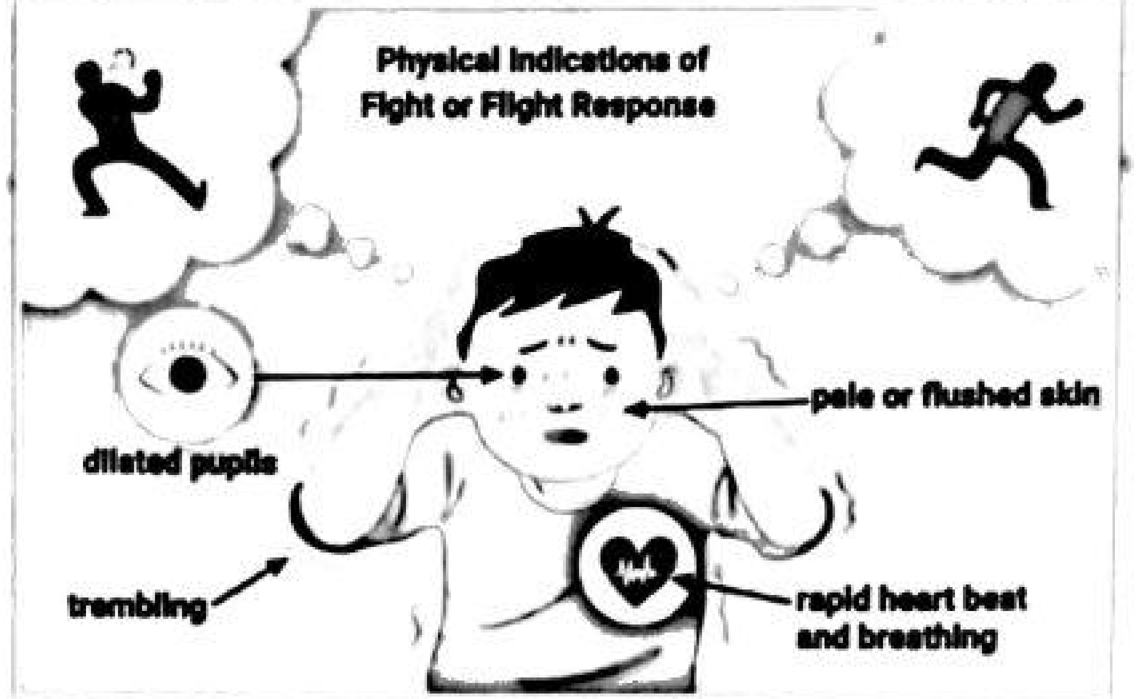
160 What will be true for the effects of parathyroid glands on the tissues shown in the given diagram?


Parathyroid hormone (PTH)
Bones
Kidneys
Intestines

I:	In bone, PTH enhances the release of calcium from the large reservoir contained in the bones.
II:	In the kidney, PTH stimulates reabsorption of calcium but inhibits the reabsorption of phosphate (HPO_4^{2-}) from the tubular fluid.
III:	It activates vitamin D, which in turn enables intestinal epithelium to absorb calcium.

1. Only **I** and **II** are correct
2. Only **I** and **III** are correct
3. Only **II** and **III** are correct
4. **I, II** and **III** are correct

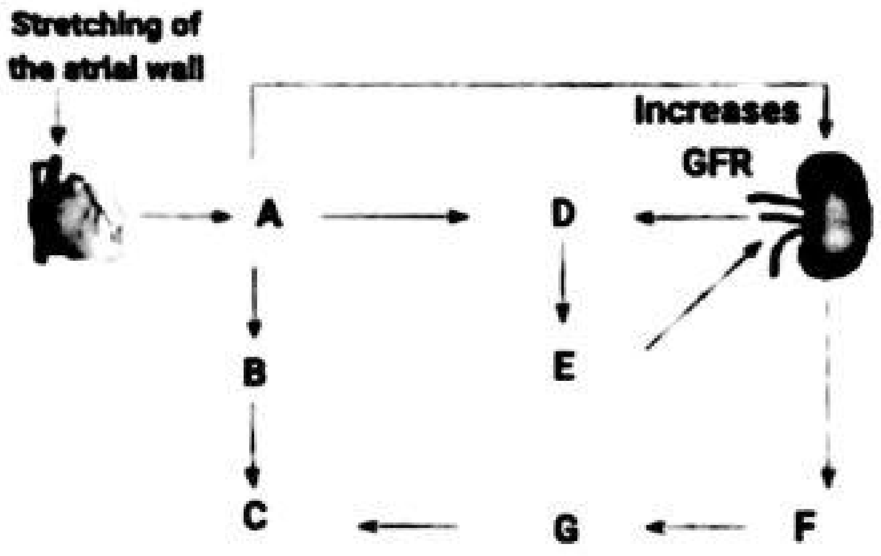
161 The given figure shows the physical indications of the flight or fight response in the human body. What else will be true regarding such a response?


Physical Indications of Fight or Flight Response
dilated pupils
pale or flushed skin
trembling
rapid heart beat and breathing

I:	It is due to the sudden release of adrenaline and nor-adrenaline in our body.
II:	The other effects likely to be seen are bronchodilation, a dilation of blood vessels in skeletal muscle and heart and inhibition of gastrointestinal functions.

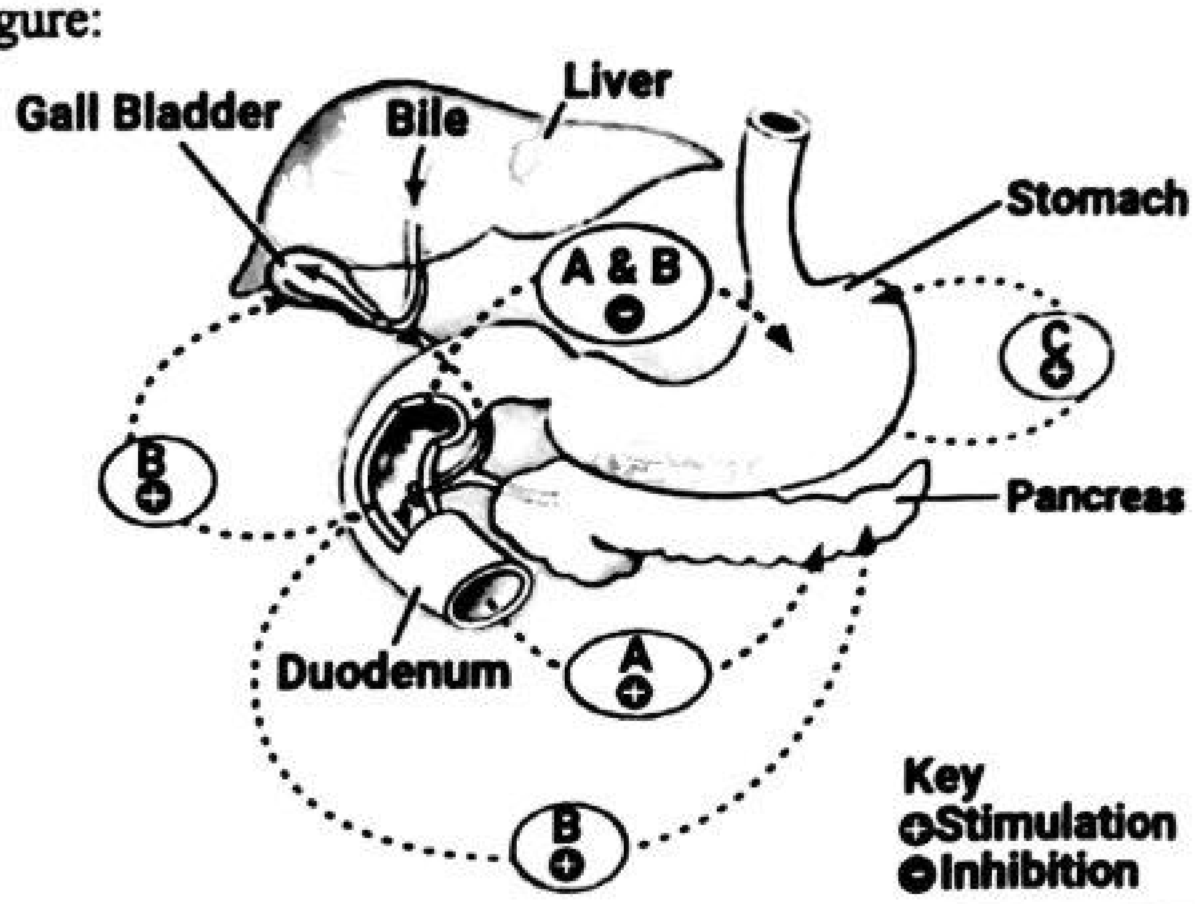
1.	Only I	2.	Only II
3.	Both I and II	4.	Neither I nor II

162 Correctly identify the match for A-G labelled in the given figure:


Stretching of the atrial wall
A
B
C
Increases GFR
D
E
F
G

	1	2	3	4
A	Atrial natriuretic peptide	EPO	Atrial natriuretic peptide	EPO
B	Vaso-constriction	Vaso-dilation	Vaso-dilation	Vaso-constriction
C	Increase in blood pressure	Decrease in blood pressure	Decrease in blood pressure	Increase in blood pressure
D	Decrease in renin	Decrease in renin	Decrease in renin	Decrease in renin
E	Decrease in Angiotensin II and aldosterone	Decrease in Angiotensin II and aldosterone	Decrease in Angiotensin II and aldosterone	Decrease in Angiotensin II and aldosterone
F	Diuresis	Concentration of urine	Diuresis	Concentration of urine

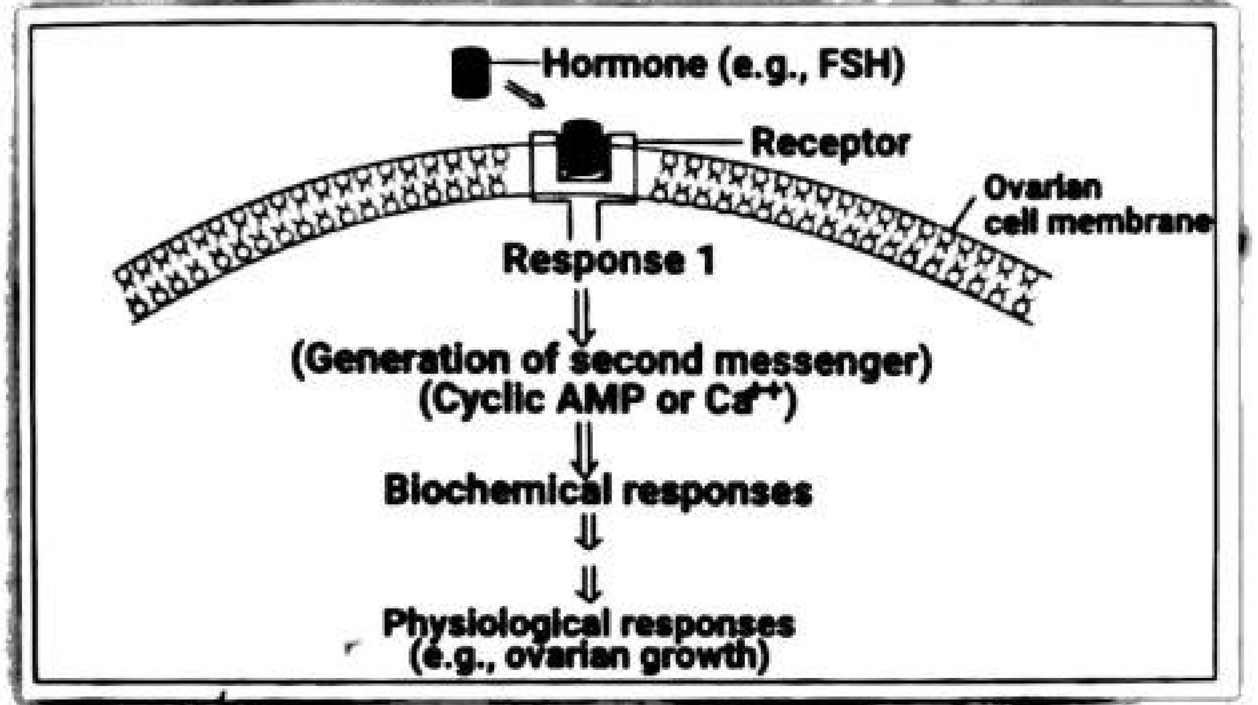
163 Identify the correct statements regarding the given figure:


Gall Bladder
Bile
Liver
Stomach
A & B ⊖
C ⊕
B ⊕
Pancreas
Duodenum
A ⊕
B ⊕
Key
⊕Stimulation
⊖Inhibition

I:	A is the hormone secretin secreted by the intestinal mucosa in response to an acid rich chyme entering the duodenum.
II:	B is cholecystokinin and like secretin, it is also an enterogastrone.
III:	C is Gastrin.

1. Only **I** and **II** are correct
2. Only **I** and **III** are correct
3. Only **II** and **III** are correct
4. **I, II** and **III** are correct

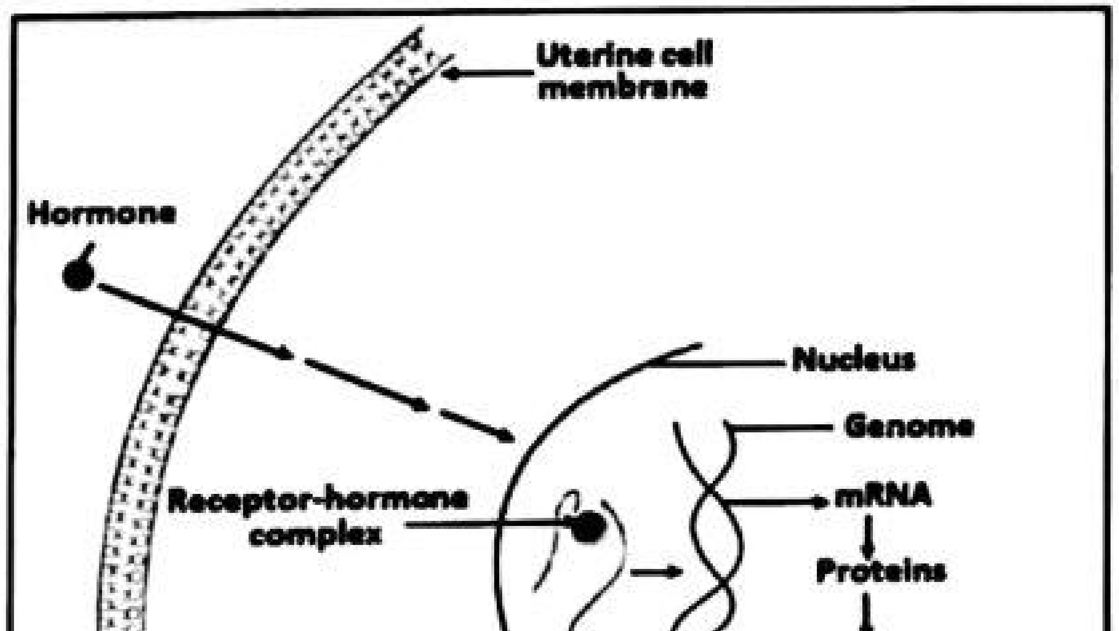
164 The given figure shows the mechanism of action of FSH on its target cells.


Hormone (e.g., FSH)
Receptor
Ovarian cell membrane
Response 1
(Generation of second messenger)
(Cyclic AMP or Ca^{++})
Biochemical responses
Physiological responses
(e.g., ovarian growth)

I:	FSH is hydrophilic and hence cannot enter the cell and therefore acts via a second messenger.
II:	The second messenger will cause physiological responses after binding to a receptor present in the nucleus of the cells and then influencing the level of gene expression in the target cell.

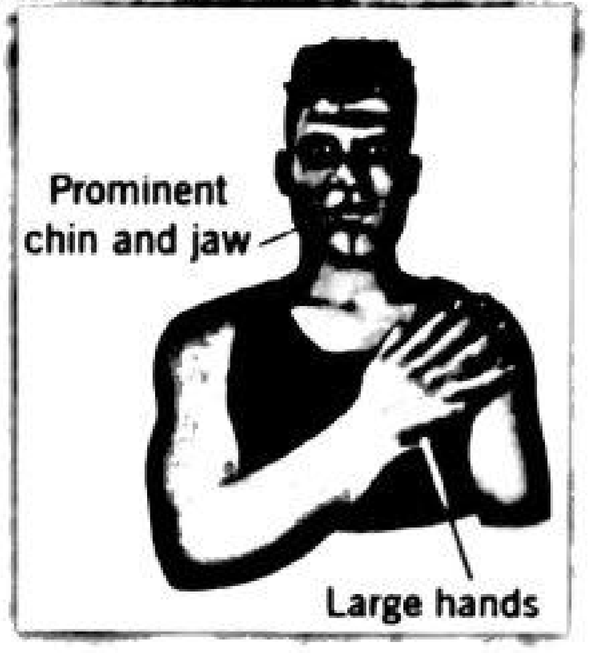
1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

165 What is correct for the hormone whose mechanism of action is shown in the diagram?


Uterine cell membrane
Hormone
Nucleus
Genome
mRNA
Proteins
Receptor-hormone complex
Physiological responses
(Tissue growth and differentiation)

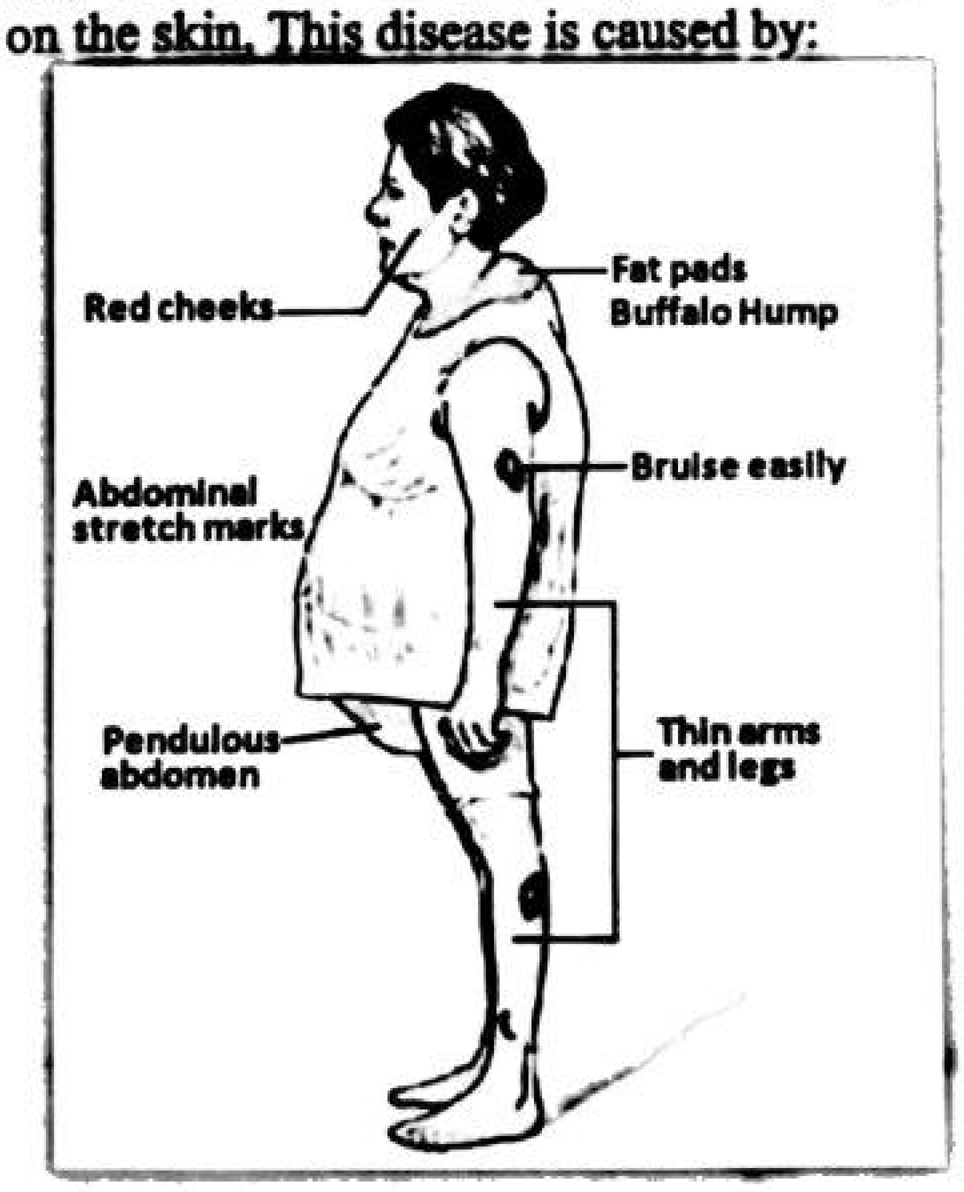
1. This hormone will most likely be synthesized by the neural cells of the hypothalamus
2. This hormone cannot be thyroxin or triiodothyronine
3. This hormone can be a derivative of cholesterol
4. This hormone will have an almost instantaneous onset of action

166 The given figure shows a person suffering from an endocrine abnormality with characteristic changes in the physical appearance like prominent chin and jaw and large hands. There may also be an enlargement of the forehead and nose. This disorder is caused due to:


Prominent chin and jaw
Large hands

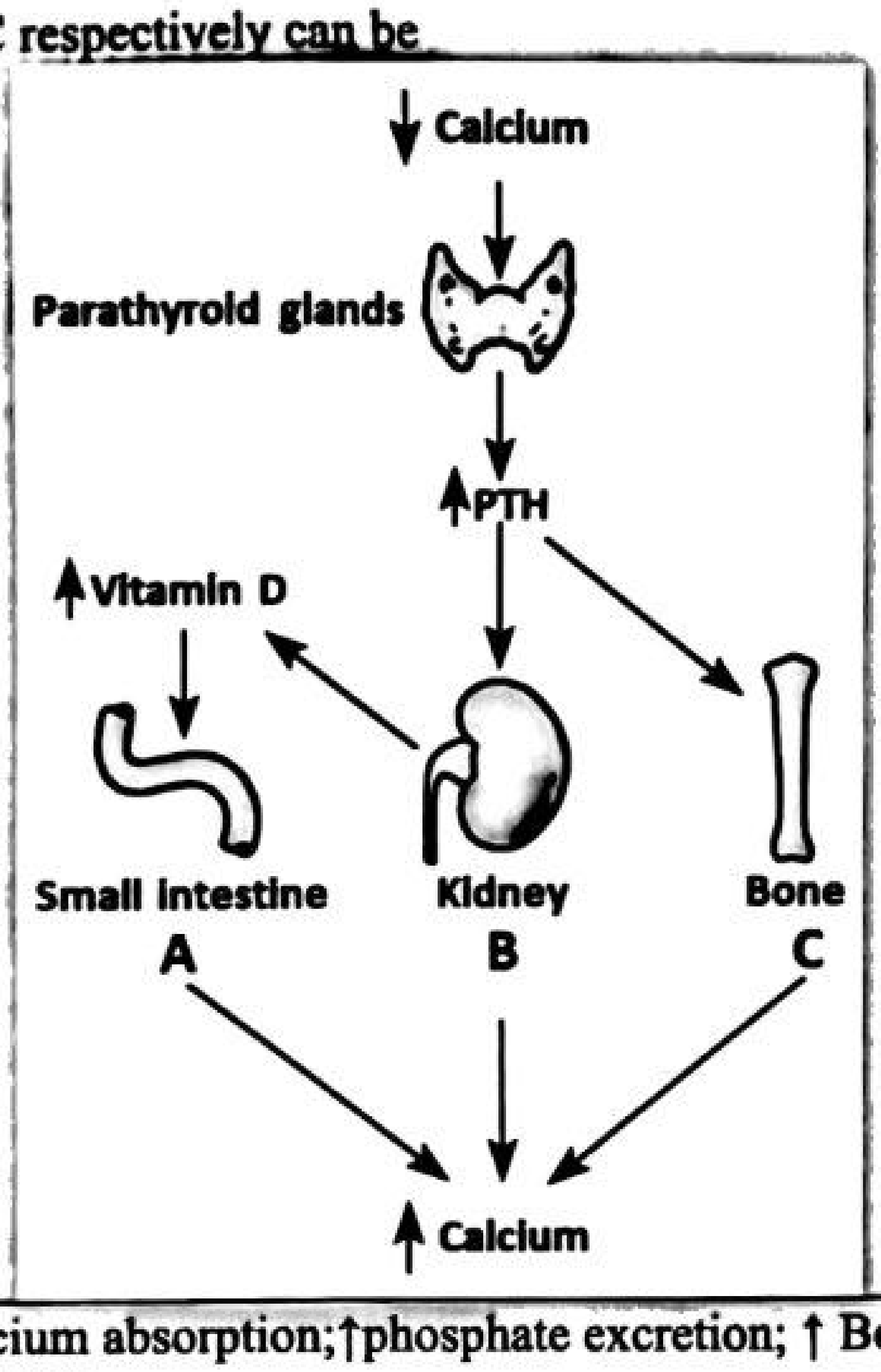
1. An excess secretion of cortisol and adrenal androgens
2. An excess secretion of growth hormone in adulthood
3. An excess secretion of growth hormone in childhood
4. An excess secretion of thyroid hormones in adulthood

167 The disease shown in the figure is the Cushing's syndrome characterized by a fatty hump between shoulders, a rounded face, and pink or purple stretch marks on the skin. This disease is caused by:


Red cheeks
Fat pads
Buffalo Hump
Abdominal stretch marks
Bruise easily
Pendulous abdomen
Thin arms and legs

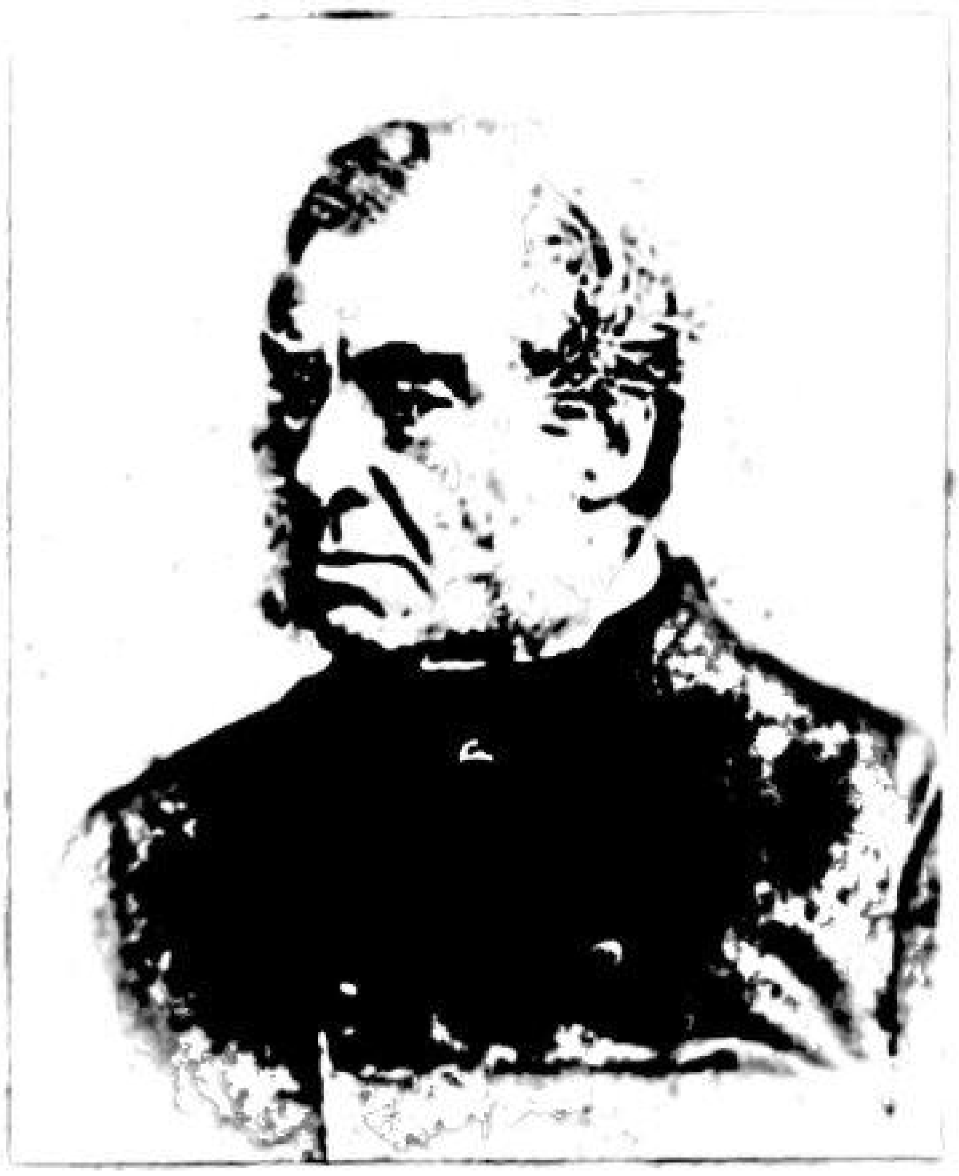
1. An excess of cortisol
2. Hypoadrenalism
3. Severe deficiency of thyroid hormones in adulthood
4. An excess of growth hormone in adulthood

168 In the schematic diagram of calcium regulation, A, B, and C respectively can be



1.	↑ calcium absorption; ↑phosphate excretion; ↑ Bone resorption
2.	↓ calcium absorption; ↑ calcium absorption; ↓Bone resorption
3.	↑ calcium absorption; ↓ calcium absorption; ↑ Bone resorption
4.	↑ calcium absorption; ↑phosphate absorption; ↓Bone resorption

169 Identify the scientist:



I:	He is regarded as 'father of endocrinology'.
II:	Despite his significant contributions to medicine, he was not widely recognized during his lifetime and worked in relative obscurity.
III:	A condition characterised by adrenal insufficiency is named after him.
IV:	One of his namesakes, was arguably the greatest inventor.

1. William Harvey
2. Thomas Addison
3. Louis Pasteur
4. Edward Jenner

FAT MCQs (UNIT IV & V) - ANSWER KEY

1.	(1)	2.	(1)	3.	(3)	4.	(3)	5.	(2)	6.	(1)	7.	(2)	8.	(2)	9.	(4)	10.	(1)
11.	(3)	12.	(2)	13.	(3)	14.	(3)	15.	(1)	16.	(1)	17.	(3)	18.	(2)	19.	(1)	20.	(1)
21.	(1)	22.	(3)	23.	(2)	24.	(1)	25.	(3)	26.	(2)	27.	(1)	28.	(2)	29.	(2)	30.	(1)
31.	(2)	32.	(4)	33.	(4)	34.	(1)	35.	(3)	36.	(1)	37.	(2)	38.	(4)	39.	(3)	40.	(2)
41.	(2)	42.	(4)	43.	(2)	44.	(1)	45.	(2)	46.	(4)	47.	(3)	48.	(3)	49.	(4)	50.	(1)
51.	(1)	52.	(3)	53.	(2)	54.	(4)	55.	(1)	56.	(4)	57.	(4)	58.	(3)	59.	(4)	60.	(3)
61.	(1)	62.	(3)	63.	(4)	64.	(3)	65.	(4)	66.	(2)	67.	(4)	68.	(3)	69.	(1)	70.	(3)
71.	(1)	72.	(4)	73.	(1)	74.	(2)	75.	(1)	76.	(3)	77.	(1)	78.	(2)	79.	(1)	80.	(1)
81.	(4)	82.	(4)	83.	(2)	84.	(3)	85.	(1)	86.	(1)	87.	(1)	88.	(2)	89.	(2)	90.	(3)
91.	(3)	92.	(2)	93.	(1)	94.	(1)	95.	(4)	96.	(1)	97.	(1)	98.	(2)	99.	(3)	100.	(2)
101.	(2)	102.	(4)	103.	(3)	104.	(3)	105.	(4)	106.	(3)	107.	(3)	108.	(1)	109.	(4)	110.	(3)
111.	(2)	112.	(2)	113.	(1)	114.	(3)	115.	(2)	116.	(3)	117.	(1)	118.	(1)	119.	(4)	120.	(4)
121.	(2)	122.	(3)	123.	(4)	124.	(2)	125.	(1)	126.	(4)	127.	(4)	128.	(3)	129.	(1)	130.	(2)
131.	(4)	132.	(1)	133.	(3)	134.	(1)	135.	(3)	136.	(2)	137.	(4)	138.	(2)	139.	(1)	140.	(1)
141.	(4)	142.	(4)	143.	(1)	144.	(3)	145.	(1)	146.	(1)	147.	(3)	148.	(1)	149.	(2)	150.	(1)
151.	(3)	152.	(2)	153.	(3)	154.	(2)	155.	(1)	156.	(1)	157.	(1)	158.	(3)	159.	(3)	160.	(4)
161.	(3)	162.	(3)	163.	(4)	164.	(1)	165.	(3)	166.	(2)	167.	(1)	168.	(1)	169.	(2)		